Alexander Monro, Sr.
Monro's Lectures

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Monro, Alexander
"

Crawford

Observations upon the ... om the
and Nerves ——

There yet remains of the Human Anatomy
to go thro, the Angeology, or Blood Vessels and
Neurology or Anatomy of the Nerves: Both
of which I am obliged to demonstrate on the
same Subject, and therefore you can't ex-
pect that I should follow the same order
laid down in your Books Viz.t ——
Begin at the fountain the heart, and trace
them to their Extremities. — I must begin
with those parts that are most subject to ob-
struction, so as to dispatch them first & to
proceed as is most convenient, and give
you some observations of the Disease as
I go along.

The containing part of the Trunk of the
Body comes first to be examined, and this
I think may be divided into three divi-
sions, according as they receive their
Blood vessels from different parts ——
Viz.

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re part from the Clavicle to
ubis are served from the Mammary
& Epigastrick, the Back part by Vessels
directly down from the Aorta & the sides
by the Intercostals, but before we proceed
to the demonstration of these parts it will
be necessary to premise a few general
principles of both Arteries & Nerves. —
1st The Arteries are those pipes that arise
from the heart, and carry the Blood to all the
parts of the Body from it. — They were so call-
ed by the Ancients, who thought they conveyed
an animal Spirit or Air. They were by some
called Cones, whose Base is the heart, But
they are no more Conical than a fir tree
when the Branches are lopped off, for we find
the sum of the Diameters of the Branches
put together is greater than that of the Trunk.
2. The Characteristicks of Arteries are that they
have a pulsation or Relaxation & Contraction
answering to the Systole & Diastole of the
heart and its alternate motion in proportion

to

to their Diameters & distance from the heart, and we find in fact, that in the Extreme Branches of the Arteries, there is very little pulsation to be observed even with a Microscope, and if we consider that the Glass magnifies the area of the space & consequently the motion is multiplied in the same proportion to the size of the parts the Pulsation will be found very considerable. This is likewise proven a priori; For 1st. Liquors going into the Orifices of Tubes of equal size, with the same Celerity, the Velocity with which this liquor flows out at their Extremities, will be reciprocally as their length, and in very long Tubes, we see that the fluid quite stops.

2dly Their distance from the heart & its propelling force. 3dly The on all Arteries being less Contractile, do not repell so strongly.

4thly The Momentum of Fluids in running

thro

4. thro Tubes, is less in proportion to the Curvatures & more to the Angles which this Tube has, so that from all this it appears that the pulsation in the small arteries, must be very obscure, if any at all.

3. That are diff.t degrees of Arteries, according to the diff.t kinds of Particles in the Blood; viz.t Sanguineous, Serous, & Lymphatick, and by this the Secretions are performed.

4.th The Blood carried forward by the arteries is carried back by the Veins, after it serves the purposes of Nutrition, but it is only the Arteries I demonstrate, as the Veins cannot admit an Injection as those run thro' Muscles, have Flood-gates or Valves, that hinder any thing from going from their Trunks to their Extremities.

5.th The Action of the arteries on the Contained Fluid, mix the particles of it, so that tho composed of very heterogeneous matter

ter

matter, none of them are allowed to take their own proper disposition, or nature, but by the Agitation, the whole is made a mild bland fluid. —

When I talk of a branch forming an Acute Angle, or and Obtuse, with the Trunk from which it arises, I mean the part of the Trunk behind the Origin of the Branch, otherwise it will confuse us greatly. —

7th. Many of the minute branches of Arteries, are so small that they wont admit a colouring powder, which are these of the Skin that are seldom made red with the most successful Injection, but oil of Turpentine will be made to pass thro' the Pores by way of Sweat, and the Injection that appears so prettily in pieces of the Skin are Chocal, and only the Tunica Cellularies, and by drying with the Skin makes them appear as one. —

The

Q. The Nervs are these small white Strings, that comes out of the Enceplialon, and Medulla Spinalis and are the principal organs of Sensation, Nutrition & motion, some way the only, but I shall say no more than that they are the principal nor have I a mind to enter into that grand dispute, whether they have these properties by Vibration or a Subtile fluid running thro them, it is enough for me to know what is their action & use, without enquiring into the modus agendi nor do I know of any thing of that Phenomenon yet I will have frequent occasion to mention it as Sympathy only, that it is such is very certain, and so when I find one having the Tooth Ach in the upper jaw, the Eye ball & lids are much affected & pained & when it is the lower jaw, I have a most violent pain along the side of my head, neck & breast; I call this the sympathy of the

Nervs

Nerves without running to a Sensorium.

These then are the Plan on which I proceed and at least may be made so clear as to convince any reasonable man, tho' not a strong Partyman ——

Lect: 2d: Yesterday you observed the branches of the External Mammary Artery coming out of the Breasts and distributed on the External parts: The Internal you observed coming out by the Cartilage Ensiformis and running down along the Musculus Rectus abdominis to join and anastomose with the Epigastrick which you also saw coming out of the abdomen crossing the Chord and running up by the Linea alba to meet with the former. You may remember when I was talking to you of the Amputation of the Mamma I told you that you was to expect two or three branches of the external mammary rising thro the Pectoral Mus-

cle

8. Muscle, and one of them just by the Edge of it, which for that reason is commonly worse to stitch than any of the other Branches. — In the operation of the Hernia I also told you, you sh^d cut towards the outside, and direct your knife to the spine of the Os Ileum and you now clearly see the reason of that Caution; Viz^t. if you cut inwards you might open the Epigastrick Artery and so bring on a fatal Hemorrhage; likewise, when I told you that sometimes the Cartilago Ensiformis was turned Inwards and pressing on the Liver or Stomach would inevitably kill the Patient at length the only way I thought of relieving him tho' desprate enough) was by laying the Cartilago bare and fixing a Screw in it to pull it up.

In this operation you must take care of the Internal Mammary that you saw coming

coming up betwixt it & the Cartilago of the
first false Rib, and so on downwards to the
Muscles. —

From the Inoculation of the Mammary &
Epigastrick arteries, Physicians have
endeavoured to account for & explain
the great Sympathy and Connection betwen
the Mammary & uterus, because a branch
of the same Epigastric is bestowed on the
uterus. They observed that at the particular
Stages of Life, they were alike affected, Viz.
First when Girls have their Menstruation com-
ing on the first time they have a distension
of the uterus and pain in the Back, at the
same time they have a pain & more than or-
dinary inflammation of the Mamma.
2dly After Child Birth, when the Placenta
is separated from the Womb, there is an ha-
emorrhage, and when that stops, which it
does in two or three days time the Breasts
are so tumified and pained that they bring
on

on a Fever. and 3dly at the time of life, when the Catamina leave Women they are then most Subject to the Scirri, Cancers of the mamm&, and all this according to their Theory happens by the superfluous blood distending the Uterine Vessels, being brought by the Epigastrick to the Trunk & so to the mammary Vessels by the Anastomosis. — But these Gentlemen did not consider that Arteries joining with other arteries that come in opposite direction can have no such property, nor do I see how the blood of the Epigastric could be carried back by the mammaries in a contrary course to that of their own Blood If the obstruction that was in the branch that goes by the Cartilago Xephoides, it might be affected, but in no other way, and I know not if that ever happened. We must then seek for a Solution of the Phaenomena some other way, and indeed it is quite evident when

we

when we consider that 1st. The Uterus and Mammæ are very much of a similar Structure, both the most glandular parts of any in the Body. The Mammæ have no muscles to press on it any action whatever, and the Uterus is suspended in a wide Pelvis, without any pressure at all more than the former. 2dly That the Refluent Blood from both must mount up contrary to its own gravity and the Veins in either want Valves, and 3dly They are formed of many Divarications & Ramifications of Vessels that will make the Remora of the Blood longer in them as wanting the pressure of the Muscles than in any other part. From all which it plainly appears that they will be pretty nearly alike affected with morbid Causes and accordingly we see that in the three mentioned cases there is a Plethora, or a number of unactive viscid Particles flowing with the Mass of Blood

which

which fall on the Mammæ, as having the loosest & most glandular Contexture, with the additional disadvantage of the Blood mounting upwards, and the Veins wanting Valves, and a few days before the flow of the Menses in Girls, & after the Suppression of the Lochia in lying in Women, the Back & Loins are very much pain'd as well as the Mammæ, and when the Mouths of the Uterine are opened again the one and the other disappear. — Further, about the time the Menses are about to leave Women, there must be a considerable change in the Animal Œconomy by the Suppression of an ordinary Evacuation, which being retained makes not only a Plethora, But the Blood in general of old people is more disposed to Cancerous Obstructions than that of young, and will more readily at this time of life take that nature, as we see in fact it is so ——

There

There is another piece of Theory about the origin of the Epigastricks, as being in a manner reflected from the Trunk, but this is false, and consequently the Theory built on it must necessarily go for nought, but when we come to have the Vein of that part, I shall talk more fully of it. —

Another thing to be questioned is, how the Containing External parts of the abdomen, have small Vessels sent to them up and down to meet one another, and no large Trunk or Branch from the next large Vessels to them —

The answer is quite plain, that if there was a large Trunk here the parts are so Moveable and have so much Action, that in the different Postures of the Body it could not avoid being Compressed, which would obstruct the course of the Blood in them & bring on a Gangrene, and for the same reason the Intercostals are so numerous & so small,

for

for no large Trunk of a Blood vessel could run between the Intercostal Muscles as they do, without being compressed in Respiration, whereas there being small pre: vents that Inconveniency both here & in the Muscles of the abdomen as they can run in the Interstices of the Muscles & supply the parts equally with blood as a large Vessel would do, and the blood running in different & opposite direction according to the course of the Epigastric & Mammary Vessels is another wise provision, that if one of them is obstructed, the other may supply the Mu: scles with Blood, which would not happen if they both run in one course, and it is hardly probable the cause will compress them both at once.

Lect. 3. Yesterday you saw the heart & great Vessels about it, with both Auricles & Ventricles distended with Wax, but you are not to suppose this is a natural

State

State, no more is that you saw in the recent Subject, for in the one they are both distended and in the other they are both collapsed whereas in the natural way, their distension & Contraction are alternate, or on one side is collapsed while the other is stretched.

You saw the Phrenic Nerve in its way to the Diaphragm resting on the pound of the heart in those who have violent Palpitation of the heart or the motion of it strong, for I have seen it so much in some that it could be seen thro their Cloaths, there is a painfull something like Cardialgia and is commonly supposed to be in the mouth of the Stomach, but in fact is the Compression & Irritation of the Phrenic Nerve by the motion of the heart, and the only cure in such a case is to absent from Exercise, or any thing that will increase the Circulation and Consequently the motion of the heart, as

that

16. that will increase the Compression or pain — You saw the Coronary Arteries rising immediately from the Aorta and running in the furrows at the Limus Venosus where they are least compressed, carrying the Blood in contrary directions to each side of the heart, and spread their branches quite round in so much that Ruysch imagined they meet & made a compleat Circle, but this is false, only some of the smaller Branches communicating with one another —

The Aorta you likewise observed coming from the left Ventricle, & ascending a little to the right side and then turning a little to the left, makes a Curvature downwards before it makes the Curvature, or at least just at it, it sends out the common Trunk, which immediately after divides & forms the Carotid and Subclavian of the right side, immediately after it sends out the left

Carotid

Carolid and after that the left Subclavian, but before that the Curvature of the main Trunk of the Aorta is so large that the least branch may be said to arise from the Aorta Descendens, or at least to be a little reflected.

From this Origin of these Vessels may be said I think with some reason that there is a natural cause for the preference given or Superior Strength to the right Arm, as we see the more Blood is carried to a part cæteris paribus the more strongly their Muscles will act, and that the Carolid & Subclavian from which last comes the axillary that serves the Arm coming out from the Aorta in a streight line will probably have more blood sent into them than those of the other Side that are little reflected is very certain, and it is as certain that there is very little difference at first in the Right Arm that determines the generality of people of all nations to use it. I am far from

from saying that the Natural difference is sufficient to counteract the Effects of habit or Custom, which is itself a second nature, I only say there may be such a difference as at first determines the choice & that afterwards the Superior Strength comes by use and practice, and whatever part I have most used will become strongest & most brawny, as appears plainly from the arms of Tennes players, and the leg of a person who had the other amputated. But when I come to the Comparative Anatomy, I will again contradict this assertion, for you will see Quadrupeds that in one of their Subclavians, there is an evident disadvantage to the motion of the Blood, beside the other, both from the Reflection of its Origin and number of Vessels, and you know that a number of small Vessels of equal Capacity, with one large Vessel will yet have larger Surfaces, & consequently the motion of the

Blood

Blood in them slower, and yet in Beasts
there is no difference in their Right or Left
Side as to strength ——

Lect: 4th You saw the Trunk of the Aorta
ascending and the three large Branches,
which immediately after divides into 4th
to serve the Superior parts of the Body, and
from it after it makes the Curve, you
observed the Intercostals going to each
side, and then the Bronchial arteries
which are uncertain in their number &
Origin, some of the Superior Intercostals come
likewise from the Subclavian.

You easily observe that the Arteries going
out to serve the parts of the Thorax itself are
very small, and arising from their Trunk at
very oblique angles, there is double good reason
for this, first, if the arteries were large or rose
at right or Acute angles, being so near the pro-
pelling force of the heart, a much greater
quantity of Blood would proportionably rise
thro'

20. thro' them, and with much greater celerity than in other Vessels, which would confuse the Animal Oeconomy, as in Vessels of the same Diameter, the blood runs commonly with equal celerity in every part of the body: and 2dly No greater Vessels could remain in the Spatia Intercostalia without great danger of Compression. — The Blood is returned from the Intercostals by Veins which open into the Azygos, and that again into the Cava Superior. But when we consider there is no other Course they could take but would much expose them to Compression from the Pulsation of the heart, Aorta, or other great Vessels for we will see and admire the Machanism —

and another wise provision to prevent the Compression of the same in all Vessels, is, that they dont open into one common Trunk, and then at once into the Azygos, but 1, 2, or 3, small Veins join & enter a little below that and

and so they open gradually into it without any great danger of Compression, but as you know the Trunk of the Azygos lyes on the right side of the Vertebræ, the Intercostal Veins from the Left side must cross under the Aorta before they can enter it, hence perhaps it is the reason that for one Pleurisy or inflammation of the Pleura, that happens in the Right side there is at least two on the left, for when the Blood is rarified by a fever, or any other cause that makes it occupy a greater space than ordinary, and dilates or increases the Actions of the Vessels, the Aorta will readily compress the Veins, and tho' perhaps not so much as to bring on a Pleurisy or Obstruction in the Pleura, yet the Blood being equally rarified in these Vessels as in those of the rest of the Body, the Compression may be such as to give the over agitated particles of the Blood a longer Remora in them & consequently an

22. an opportunity of sounding obstructions, the same thing will happen from the sudden Constriction of the Vessels, being exposed to cold when very warm — another Speciality is that the Azygos has a Communication with the Cava Inferior by which the blood will come to the Sinus Venosus if the azygos was compressed by a particular of the Body of Tubercles in the Lungs.

The Caliaca you saw was the first that arose from the Aorta after it entered the abdomen wch. divides again into two Branches, one goes to the Left, and the other to the Right Side, the right gives off the Gastrica Dextra which goes to the Stomach, a branch to the Omentum, the Cystic that goes to the Gall Bladder, and from the Trunk that goes on the Dorsum of the Stomach goes off a small Branch down to the Duodenum called Intestinalis. It also gives some Branches to the Liver, the Left gives another

Branch

Branch that is spread on the Fundus of the Stomach, the Epiploic Sinistra to the Omentum & the Splenica to the Spleen some Authors of very good note too imagine and say that the Splene Artery is larger than the Hepatic, but this is wrong, it may be that it is proportionally larger, but it must be considered that the Hepatic Artery is not what serves the Liver with blood, but also the Vena portarum, it must also be remarked that the Vessels running on the Stomach on large branch on the Fundus and another on the Dorsum sending out small Branches to meet & Anastomose with one another, may have a very considerable effect upon the blood as running in contrary Streams & clashing the Particles one against another. The next you saw coming off from the Aorta Descendens, was the Mesenterie Superior which came out thro' the Pancreas & giving off twigs to the

the Glandulæ Renales. The Lumbares Inferiores go directly to the Inferior Mesenteric to be distributed to the Intestines, when they come to the Gut they separate into two Branches, one of which goes on each side & no Anastomoses on the Back — In the Mesentery of the small Pendulous Gut they especially the Arteries from many arches one above another as they creep along, and this is necessary to hinder the Blood from Stagnating, by the flexion of our Bodies in several offices of Life. To prevent the same Inconveniency the largest Anastomosis is in the Mesentery of any part of the Body. Some Authors say there are large Inosculations in the head, but unless it is between the branches of the Vertebral and Carotids, I know of none equal to those that obtain in the Gut. The root of the Mesenteric is defended from Compression by coming out of the Pancreas immediately

immediately below the Stomach, The Nerves I shall say nothing of till you see their Origin & then you will have a compleat view of the whole —

Lec.5th You saw the distribution of most of the Vessels from the Celiac & both the Mesenteric branches. All the blood that is carried back by the Veins corresponding to those arteries, that is all the Blood from the Chylopoetic Organs is carried & discharged into the Vena portarum, which is again distributed thro' the whole Substance of the Liver — and I mean not if the Blood impregnated with a great many watery and oily particles from the Chylopoetic Organs, and carried directly to the Liver, may not conduce to furnish the particles of the Bile, which is there separated from the Blood, the Veins open into the Canals of the Gulls by much greater Orifices than the Arteries do, which is seen by

by Injecting them backwards, and would signify that the same Mechanism obtains in other parts of the Body, for the more ready absorption, of any Extravasated Liquor.

You saw two small Arteries arising from the Aorta a little below the Emulgents, and running down to the Testes in Men and Ovaria in Women, these were the Spermatic Arteries and the blood is returned by Veins exactly corresponding to the Arteries, the right opens into the Cava, and left for the most part into the Emulgent of the same side, but here there is variety often — These Veins have no Valves & as they sustain a Column of Blood, which must maintain contrary to the natural Gravity, are considerably dilended, and so much near the Testicle that they are called Corpus Varicosum, and above they are so spread and intermixt that they get the name of Corpus Pampeni: formed.

From

From the Decussations & intermixing of the Spermatic Vein, and Artery, a great dispute arose, whether or not they anastomose with one another. The ancients, almost to a man, believed they did, & some of the Moderns have endeavoured to defend it, and further say, that it is a structure necessary, as the grossest particles of the blood are carried away by the Veins when they anastomose with the Artery, and so only the finest parts carried down to the Testicle. Scal Scalis offered a demonstration of the Experiment, Viz: He opened the abdomen of a Lamb, and a little above the Testicle made a firm Ligature over the Vein, so as no Blood could pass from the Testicle to it, and yet he observed it was turgid & as full of Blood as ever, next he made a Ligature betwixt the Vein & Cava, or Emulgent, but found it did not become more turgid than it was before;

from

from which he would Conclude, that in the first Case the blood was carried to the Vein by Anastomosis and in the second it was carried to the Artery.

The next Votary of this doctrine was Comm: Mc Mortimer, and he endeavoured to prove it by Experiments as follows. He injected the Artery and Vein with a gross Injection of Wax, Tallow &c, that for the Vein coloured with a red, and the Arteries with a green powder, on dissecting them he says he found all the Artery green, and the Vein red, but in the Anastomosing the different co: lour obtained, and made people think it incontrovertible. And before I confute these; it will be proper to observe that there is a great variety in the rise of the Artery and opening of the Veins, I have seen the former from the Artery of the Capsula Atrabilarice Aorta Emulgens, & as uncertain as the Vein ——

J

I think nothing of the Ancients that were ignorant of the Circulation of the Blood. being misled by the Decussations and Intersections of the Vessels to imagine they inosculated and in fact we find Aretæus asserting that they not only communicate with one another, but the arteries for some space within the Vein. Lea Lealis Experiment, tho very specious is worth nothing to prove his doctrine, for how does he know but the blood might be carried by other lateral Branches opening into the Vein or rising from the Artery. Or does it always hold in other parts of the Body, that when a Trunk is tied the Circulation there ceases, or the Blood Stagnates in it? Sure not; and we have daily Instances to the contrary.

Mortimer is as ill, if not worse. He Injected the different Vessels with different powders, and found they precisely melat

the

the openings, by which they communicate without going from the Vein. Sure the honour of this Experiment does not so much belong to the Ingenuity of Mr. Mortimer, as to the strange Sagacity of Wax, which just remained at the Communicating Orifices, and would go no further than it was proper for Mr. Mortimers doctrine it should. But allowing the appearance was as he represented, might not the purple Colour arise from the different coloured Injections getting into the Vessels that are on the proper Coats of them, and so make a Colour mixed of the two, that is the arteries on the coat of the Vein, and the Vein on the Coat of the Arteries and the Veins Arteries in some places cross one another so that from these the Appearance may be accounted for. But further, granting that the fact was true which by no means it

il is, the Theory drawn from it is false & unjust, for if the Veins receive the Globules of red particles of the Blood from the Arteries, why may not the small particles run there too? or why is there such a singular Structure here, that obtains in none of the functions of the Body, besides, and we find in fact that there are plenty of red Globules of the Blood coming to the Testicle as may be seen in opening it in any Creature whatever. So that all this doctrine is absolutely false as far as I could learn by the strictest Enquiry & I am surprised to see Winslow so dubious about it ——

The Yellow Coat of the Intestines is plainly a continuation of the Epiderm is going in from the mouth & by the Anus from the Hips which may be easily traced from both. All the different appearances they have, are the one being all Scaly & the

the other Velvety Substance which is not enough to prove them contrary as the Scales are, what fill up the Interstices of the pores and the Villa are produced by being Macerated & constantly lubricated in a Liquid and I am glad to find that tho' D.r Haller had a different opinion of this from me in the first Edition of his Notes on Boerhaave's Institutions, he has since assumed the same opinion, and I would further say that it is further continued by the Lacteals to all the Vessels of the Body, & indeed it is by far the most proper Substance as being incorruptible & not easily destroyed, so that if it is not a Continuation of the same Substance, it must be similar to it, to answer the necessary purposes it is designed for in the parts it lines.

Sect. 8th When the Aorta comes to the Os Sacrum, it divides into two great branches, the Internal & External. From the Internal

Internal comes the Hypogastrica that serves the Vagina, Uterus, Vesica Urinaria, Vesiculæ Seminales and all the parts of the Pelvis; From the External Iliac when it goes out of the abdomen rises the Epigastric which ascends on the muscular Rectus abdominis (as said before) and the rest forms the Cruralis which serves all the Muscles of the Thighs.

From this distribution one view of the Sexes will easily appear the reason, why in Girls & Children, the Internal Branches is larger than the External viz. Children do not use the Muscles to which the latter Branches is distributed, & consequently there is not so much occasion for such a quantity in them as in Men who fatigue, Exercise & labour greatly and perhaps it may be a little owing to the quantity of Blood sent to the External Iliac that some Children come to the use of

their

their lower Extremities sooner than others. For the same reason they are commonly larger in Men than in Women, as they first use their legs most, but in Child bearing Women tho' they use the Muscles of the Thigh as much as men, the Internal Branches will be largest, as during the time of Pregnancy, or Uterine Gestation, there must be greater quantities of Blood sent from the Internal Branch to the Womb to serve the Fœtus and provide for the increase of these parts —— The Carotids after the right separates from the Subclavian, the left rising from the Aorta give off no more Branches till they come to the Larynx, wch is the largest of any Artery in any part of the Body, without giving off Branches & therefore the fittest for making Experiments on the Gravity and Velocity of the Blood, as that whole piece may be taken out without any Connexion whole & full of the Blood

Blood. At the Larynx it begins to give off Branches. Thyroid, Faucal & Cervical Branches, and a branch to serve the Mus: cles of the tongue. The Carotid then divides into Internal and External Branches, the Internal (tho denied and after matter of dispute) is the most regarded, & consequently if the Theory founded on it was true the gross particles would be brought to the Brain, as particles move difficultly in Tubes, according to the rectitude of those Tubes, but you are not to imagine that the Crook is as great as it appears, for the Injection would crook it more, as the head is thrown backwards when the Injection is thrown in & consequently the Artery on the Stretch, the Blood is carried back from the head to the Jugulars, which open into the Subclavian, the External Jugulars communicates with some of the Internal Veins, and by that means

the

the Blood of the Encephalon may be in some measure carried that way. —

The External Jugular is open very often and I told you it was the easiest part of the Body to Blood at. Therefore and still subsists a very hot dispute whether the blooding in the Jugular Vein was most Efficacious in disorders of the head or lower parts of the Body. One party imagines that the blood coming from the heart to the head, and by that means a greater quantity was sent to it and this they call Derivation. The other side thought that the quantity of Blood in the heart was immediately lessened and the Obstruction resolved, and this they call Revulsion. — The French and Spanish Physicians to this day are very fond of the Derivation Blooding and always open the Vena Saphena if possible for diseases of the head while

e contra the Scots and English loaman
are for Revulsions. I think this is a
question very difficult to determine, &
all I can say upon it is, that I know a
very large Orifice in a large Vein, will
have more effect when strong Revulsion
is indicated, in any part of the Body.
I know the good Women are fond of the Sa-
phena in Obstruction of the Menses, and
will roar at you if you pretend to do it in
any other place, but I once saw a Woman
that had very violent Symptoms from
Obstruction & required Blooding much,
and when the Saphena could not be found
I bled her in the Arm, in plain contradic-
tion to all the Women, and yet the menses
began to flow soon after, it scarce gave
them time to retire, and I think that
the Vein and Orifice as to their size &
Quantity of Blood that flows in a given
time, is more to be regarded than the situ-
ation

situation of the Veins, whether in the head or foot.

If a strong Plethoric man is taken with a Pleuretic and inflammatory disorder you would certainly chuse to Bleed him ad animi Deliquium, but without drawing so much as to weaken him afterwards, or to throw him into a dropsy. Therefore make a very large orifice in the largest Vein you come at & suffer the Blood to stream out impetuously, by this means he will turn weak ish and faintish before you get all or above 1½ lib. of Blood, whereas if it run out slowly, the same man would perhaps lose 6 lib of Blood before he fainted.

There is another Patient that requires to have a good quantity of Blood taken away, but is of such weak nerves and lax fibres, that he is ready to faint and continue in it

el, for some time, perhaps never recover;
how then would you open a small Vein
with a small Orifice so as to get the Blood
gradually. But if the Vein is very small
you will not get the proposed quantity
at any rate, so that you may still open
the large Vein, and there is a very easy
Expedient to hinder the Blood from flow-
ing out too fast, which is by keeping the
Ligature very slack, or taking it off wholly,
if the blood stream out and allow it only
to drop down the Arm, and thus way
you may take as large a quantity as
you please without fainting. — You
observed in the Dura Mater of the
adult Subject strong muscular fibres,
which with the Pulsation the Brain
was observed to have when the Skull was
opened either by the Trepan or Bregma
in Children, gave rise to that Hypothesis
supported by Bellini and some others,

that

that the Dura Mater was the principal of all the Motions in the Body, soon after the Brain was observed to have the Pulsation after the Dura Mater was taken away, and it was then thought that the Brain had a natural Pulsation proper to it. From what I observed to you in some place of Bones in General, you will easily collect some reason for this seeming Pulsation in the Brain, when the Cranium is opened, without supposing it to have a principle of this alternate Motion. I told you that Bones were full of Marrow, or some other Substance without any void at all, and this Mechanism was absolutely necessary for as the Expansibility or Rarefication of our Liquors while Young, is far Superior to the Contracting or Inward Contraction of the Vessels this Support from the Bones was necessary to hinder the

Vessels

Vessels from being overstretched & the
soft parts of the Body have a pressure
analogous to that from the atmosphere
but is denied to those Vessels with Bones,
so are not capable of being compressed by
the atmosphere There will be equal ne-
cessity for the same mechanism within
the Skull unless the Coats of the Vessels
there were proportionally stronger than
in any other part of the Body, or able to
overcome the rarifying force of the fluids,
but this they are not, but are rather
weaker and more lax in their Coats, so
that we can easily see when the Skull
is opened as in the Fons pulsatilis of
Children or in the Trepan, the compress-
ing force or support being taken from the
Vessels their contained Liquor will
expand themselves and the pressure
of the atmosphere getting likewise
access from without will make a

Pulsation

Pulsation while the Bone is open with-
:out supposing that motion to subsist
while the Bone is entire, for then the
Vessels had a support to keep an Equili
:brium and the access or pressure of the
Atmosphere was also denied Further
if this motion was wanted there behoved
to be some Vacant place in the Skull
for allowing it, and this same space
must be filled with something either
Air or Water, if water, they say it is an
incompressible Body: and if air it must
have had some Communication with the
External Atmosphere, else it would lose its
Elasticity and indeed a priori, in a part
where such a free equable and uniform
motion of the Liquors is so necessary as
in the Brain where the most Subtilized
and necessary Fluid as to be Secerned it
will be absurd to imagine such a Motion
which would disturb the Oconomy of the

Parts

parts and hinder their functions: But there can be no clear demonstration for either System.

You saw the Sinus of the Brain supported and provided with defences against Compressions by the Bones, to which they firmly adhere, that in all Sinus's especially the superior, longitudinal and lateral and 1/6 of their Diameter is attached to the Bone, so that every transverse Section of them makes a Spherical triangle.

The four great Vessels that serve the Brain with Blood, have Communications one with another by which means it would be served if some of the Vessels were obstructed & consequently the Body supported with animal Spirits, and the Blood equally distributed to all the parts. There is no considerable anastomosis betwen the great Vessels of the Brain, but there are innumerable ones in the small ones. — There is

is one Lewis in the Brain which I think no person was attempted to Acco.t for or see the Reason of, Viz.t why the 5th pair of Nerves ran within the Sinus immersed with Blood for some Space. The Artery that serves the Eye comes out of the Skull with the Optic Nerve and distributes its Branches to it, and forms a Plexus on the Retina that makes it looks like a Convulation of the Vessels when tolerably Injected. It likewise gives Branches to the Lachrymal Glands. From this Distribution we may see why the Ancients took their Prognostics so much from the Eyes, and why in high Fevers & disorders of the Brain a rupture of an Artery is so common & Salutary because coming out of the Skull, and a Branch of the Internal Carotid Blood from it beds sooner for relieving the Brain than double the Quantity from a more distant Vessell,

we

we would be alvo led to think that opening the same Artery coming out of the Eye would be of Service in ophthalmias or other Disorders of these Organs and in the Observation of Hildanus, we are told of a Total Amaurosis cured by the opening of this Artery, and many other Cures of the Disorders of the head are related to opening the same Artery; but I am afraid if they used any other Remedies, they will come in for a Share of the cure as well as the Blooding: Besides I dont see how it is practicable to open this Artery while the Trunk is any thing large or below the Eye brow as it lyes under the Skin and Corrugator supercilii Muscle, and when it ascends higher it divides into so many Branches, that no quantity of Blood would be got, there is indeed a branch of the Artery, at the Internal Canthus of the Eye and of which you may feel the Pulsation in

your

your own) that appears to be easily opened but the danger here is, that it runs immediately on the Lachrymal Duct, and I dont know if ever it was tryed for that reason, besides as it is a Branch of the External Carotid, no such advantage could be expected from it as from the other that comes from the Internal Carotid. The Blood from the Globe of the Eye is returned into the Skull, by Veins which open into the Sinus Cavernosus along the Sella Turica and receives into it the 6th pair Nerves as above related. From the course of these Veins we may easily Explain, what is always related by Chirurgical observations, Viz.t That beside the loss of Sense or Motion, Giddiness or Vomitings, that indicate an Obstructed Brain, and blow on the Head there is always a Swelling or protrusion of the Globe of the Eyes also — This must always be

be the Case, for as there is no void Space in the Cranium, but wholly full, when there is any Extravasation of Liquors, whether the parts must be Compressed, and no part is more likely to feel this Compression than these Veins that return the blood from the Orbits, as lying on the Base of the Cranium, and by all Experiments by Lowers and others. Whereas if the Blood is stopt in any part, swells and becomes Oedematous as the Eye from Compression in the Brain when the Blood is obstructed in the Nerves.

Phrenic Nerve. Some have imagined that the heart in the time of its Motion must be lengthned, because we can feel it frequently with our finger beat — This Pulsation is the Systole of the heart, and is Synchronous with the Diastole of the arteries, as we feel easily, the Reason is plain for the Contractions of the heart

heart fills the Arteries with Blood so -
manly against our Ribs, but this is -
false, for the heart is so situate that its
Ventricles contracts, The Auricles with
a sudden Influx of Venous Blood push
outwards the contracted hard Ventricle,
with a Jerk against the Pleura, for com-
monly we are not sensible of this motion
but if we be hastily surprised any way,
we feel a certain very uneasie motion
or rather Sensation; The reason is the
Phrenic Nerve going down along the side
of the Pericardium, to Twist about the point
of the heart, and being inserted into the
Diaphragm is Compressed betwixt the
rigid Ventricles and Pleura when by a
sudden shock the Blood is driven into
the right and Left Auricles, & thereby
the Ventricles are made to Thump strongly
against the Ribs. This uneasy Sen-
sation is not about the heart it self, but

as

as perhaps in all Cases, where the Blood
flowing any part is Squeezed in the place
of the Diaphragm where these Nerves go
to be Inserted — It is in our power greatly
to help this uneasy Pulsation which
chiefly happens when in Bed and on
the left Side, we must desire them always
to lay on the right Side, so that the heart
can then Compress the Phrenic Nerve,
but unluckely the same very people
with weak Mobile Nerves are Subject
to another no less troublesome Companion
the Mare, and we know nothing is so
apt to occasion this, as the Falling the
Ventricles compress the last Auricles,
and hinder these last to receive their
Share of Blood easily & readily whence
it is accumulate, and does not pass easily
to the Lungs, so that People have most
intolerable Sense of weight and Suffocation,
and this is evidently shown to be the

cause

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cause of the Incubus, by a Gentleman
who lately took his Degree here / Vide
Bonds Tab: de Incubo / the same Phrenic
Nerve you see is compressed of Branches
of the 3d. and 4th. Cervicle / the remaining
part of the 3d. Cervicle is spent upon the
Musculus Deltoides and lyes off the
Should & hence some Physicians / first
Hippocrates / mention a pain in the top
of the Shoulder in an Inflammt. of the lower
part of the Liver, but I am afraid Physi-
cians have made too general use of this,
and concluded the Liver affected when it
was Sound. Inflammation of the lower
part of the Diaphragm will have the
same Symptoms, and on the Left Side it
often happens, which could not be
from the Liver to be distinguished by
this. for I have known Suppurations
in the Bowel, when there was no pain
in the Shoulder, and there's a more

certain

certain and distinguishing mark of a Hepatitis which is not so easily understood by any Verbal description, as by observation of the thing itself Viz: a dusky or Leadish yellow Colour of the face, not quite yellow, but a little that way, which never fail to accompany affections of the Liver, and to me is so remarkable, that I have on seeing people only in the Streets pronounced some Obstructions of the Liver, and on Examination found it true, nay I have seen when Consulted with other Gentlemen of Physic, invited on the Soundness of the Liver, by the want of this Symptom, tho' they had all the other Symptomes, and never yet found myself mistaken by it.

I attended a Lady lately, who had a violent pain, considerably above where I judged the Diaphragm she complained of a most insupportable pain in her Shoulder

of

of the same side, even after undergoing early a considerable Evacuation, on which I pronounced her Diaphragm to be affected, the Lady dying a large Sphacelus was found a good way above the Diaphragm, yet the lower pain might have absorbed the less one, for she must have pain in her Diaphragm, and we heard afterwards she mentioned it slightly. —

Inflammatory matter had been conveyed hither and produced a Sphacelus the bigness of a finger nail. In the same way Phthisis Pulmonalis. This pain I have several times observed too, and wherever the Liver, Spleen &c are affected, where ever we have a Complaint of the Hypochondria or Thorax, the Diaphragm may either suffer originally or by sympathy, and so may produce the pain in the Shoulder, altho the Vena azyga communicates —

with

with the Vena Cava ascendens and the Vena Cava Descendens its lower part in Order that its course into the Cava Descendens be any how impeded the blood may not be accumulated in the Lungs, Muscles of Respiration &c yet in spite of all this, Inflamm.ns of those parts are very common, especially in the Left Side. Pleuretic Stitches are above three toone in the right. the reason of this is the Vena Intercostalis must creep over the Vertebra and betwixt them and the Aorta descendens, so that by the Pulsation they are frequently compressed, and their Blood must Stagnate, or the Vena Azygos passing immediately under the Aorta may be compressed by its Dilatation &c so that this may in part be a reason for it. — Mr. Chiselden attributes this Phænomenon to the pressure of the Left Lungs from the point of the heart lying so much more

to

to the Left Side Ruysch according to a Citation of Boerhaave describes a Vena Hepatica, answering to the Arteria Hepatica, and going into the Azygos D^r. Douglas describes this too, but he seems to have taken it on Boerhaaves word, for tho' I asked him to inform me how to find it, he declined giving me any answer tho' he told me frequently after that. — The place of Ruysch which Boerhaave cites, takes no notice of any such Vein, so that there seems to be a mistake some how, and it is probable that not one of them have seen such a Vein —

Ophthalmia, In some Ophthalmias, there is a visible Inflammation, yet the Patient can bear the light very well, and in other Cases when no Inflammation appears, the least Light is intolerable when only the Conjunctive

is

is inflamed, and the Patient can bear the light, it is a sign the Inflammation is seated only in the Branches of the Conjunctiva that come from the External Carotid and this Case Ex-ternal Applications Blisters &c— prove most, but where ever the Retina is irritated by the least light, as it is often in Inflammatory Fevers & tho' little or no Inflammation sh? appear, it is a sign that the artery accompanying the Optic Nerve is affected and here a more general me-thod must be tryed as V. S. &c. as for the Stimulants they seldom or never do good but harm in acute Ophthal-mias, the Incapacity to bear light is owing to the same cause as the tender-ness of an Inflammation in any other part of the Body. The 2d. Pair or Optic arising from the Thalamus Nervi

optic

optici makes a large Curve separately, and then unite the forepart of the Cella Turcica before they divide again to go into the orbits. — Some Authors affirm that in this juncture of the Nerves — their Substance is actually blended together, but this I very much doubt — From the observations of Vesalius and other Italian Anatomists who positively say that the Optic Nerve of any Eye which was blind some time before the Subjects death, was flaccid Shrivelled and yellow, while the other whose Vision remained was plump and Sound as usual, and as it is a Custom in Italy to punish some Crimes with the loss of an Eye, these Malefactors very often come to the Gallows afterwards and so come to their hands, so they have frequently opportunity of observing this, and it must be from these Experiments it must

only

only be a Contiguity of the Nerves & not an union of the Substance. — others again say, that all this Conjunction, the fibres of the Nerves decussate or Interwed each other, and on this Communication build a Solution of Seven Phgnomena of Vision, viz.: not seeing objects double, and the uniform motion of the Eyes always following each other, because, say they, any impression made on an Eye is communicated to the other doubly, but the former observation of Vesalius &c. have their full force ag.t this notion like: wise beside a Fesler and the Chamelion where the optic Nerves simply cross one another see Objects single, as they rush on their percp. and there is a more natural way for accounting for these Phgnomena, viz. we see objects single with two Eyes, because exactly the same impression is made on both Eyes at once by the

object

object & so must give but one Idea,
in the same way that whatever the
number of Musical Instruments
are, if they be brought to Unisons, or
uniformity of Sound, but if one is above
or below the rest, we immediately have
a double Idea in the same manner
likewise, if by any Internal disorder
or External force, one of our Eyes are
compressed in a particular manner
we see objects double. —

2dly The uniformity of the motion of our
Eyes comes first by a natural Conviction
we have of the impressions of Objects
being more distant and lively in pro-
portion to the number of Organs re-
ceiving the Impression, or the force with
which it is applied in a certain degree,
This we know, we see better with two
Eyes than one, therefore we turn both
Eyes to the same Object, and this by
Custom

Custom becomes afterwards so confirmed as to be out of our power to alter it, but in Children it is not so, for by attracting objects on each side, their Eyes will be drawn different ways, and some animals have this power likewise to maturity, especially those of the timid kind, and who are always on the Watch, besides we see when one is affected with any Inflammation blow, the other by Communication of the Arteries is also affected, or when one Eye has lost the sight or power of distinguishing objects, yet it follows the motion of the other as before, so that Conformity of motion was an unalterable decree of nature would be in these Cases useless, so we must conclude it comes by Custom — The Optic Nerve does not directly enter the Ball of the Eyes, at the bottom, but a little to the side,

which

60 which is so far lucky for us, for whatever
Rays fall on that part where the Optic
Nerve enters are lost, This appears by the
Experiments of Mariot and Picard of
placing two pieces of white paper on
a white wall about 6 Inches distant
from each other then Shutting one Eye
and looking on the contrary paper with
the other and so walking backwards
till they come to such a Posision that
one of the Papers disappeared, and then
considering in what posision that
paper stood to their Eye, they found it
was such that the Rays would fall on
that part where the optic Nerve enters,
so that if the optic Nerve entered directly
in the bottom of the Globe of the Eye, we
behoved to squint considerably, or see
Objects imperfectly. Nor do the Objections
of some who say it is only y^e more vivid
Colour, drowning the less lively impres-
sion

impression of the Paper make any thing against it. — From the number of Vessels in the Retina we see the reason why in Ophthalmics or Fevers, the admission of the rays of light are so very painfull and almost intollerable to us viz: because the Vessels being partly obstructed, and in every point of an obstructed Vessel there is a black mole or Spot, and when the Vessels are pervious they see in the ordinary way.

Thus it is while the Vessels are obstructed but when they recover they have the Eyes often weak from the distraction of these Vessels in time of the Obstruction. hence we may learn one Cause of Gutta Serina, or Amaurosis in the full and Plethorick; Sometimes this disease is Compliated with a Cataract and then if the Obstruction was removed, the patient could not see because of the Suffusion still remaining

62. remaining Bul if the Patient that has an Amaurosis is full and plethoric and you have any thought that this is an Inflammatory Obstruction of the Vessels of the Retina blooding ad Deliquium Animi is the only remedy; If it is from a Pituitous cold Viscid Lent or brish purges; If from Nervous the hot Stimulating Medys and so on, varying the Cure according to the cause you suspect; but it may depend upon innumerable other Causes. I very seldom attempt the cure of a Gutta Serena if it be above three or four Months Standing and our People seldom apply for a cure till that time, and for that few of them are cured Tumours of the Brain, Hydrocephalus, putrified Substances in the Optic Nerve, or a Paralysis may produce it, and it is seldom cured.

There

There is a partial Amaurosis, or Circum-
stances when the Patient sees only
part of the object, perhaps a hole in the
middle of a Shilling. &c. and perhaps
sees half a Moon in it or sometimes
more than a whole because these parts
of the Retina on which the black part
falls are insensible, and therefore the
image of it must be wanting, and this
differs widely from Musc Volitantes,
or when the little black Specks are always
seen falling downwards for when the
Sand is in the Retina the Speck is fixed,
but these Volitantes are some Blew
Particles in the Aqueous humour which
intercept the rays of light, and by the
laws of Opticks are seen inverted as the
Oily Particles are, as they naturally a-
scend in water give us the Idea of falling
down. — I know it is said that a Lens
collecting the rays of Light in a Focus
tho'

64 tho' there be many spots in it, yet won't appear or make any visible shade; But let Oil be put in the Glass, and allowed to run down while you are gathering the light into a Focus and you will see that it will have Shades answering to it, or will intercept the rays of light, and while they ascend give us the Idea of falling down.

Dark Spots in Ophthalmia. — There is nothing more common in fevers, especially in what they call Fevers of the Spirits, than the Patient seeing dark Spots in every thing, and picking the Bed Cloaths. This is a very bad Symptom, and shews that the Obstruction has penetrated far. This proceeds from a sort of Chronic Ophthalmia where the Obstruction is formed slowly and without pain, as in the Amaurosis or so. — In this case

cup

up and down the Retina being dis-
tended while other parts are not
affected the Retina is in some parts
insensible to the impulse of the Rays,
while in others the object or parts of it
are represented distinctly, so that the
Patient sees Objects full of black Spots
in these called partial Obstructions.
But if the Vessels all over the Retina
be distended, but not so as to render
the Nerves entirely incurable, the
Pat: sees as it were thro a mist, both
these I experienced. Sometimes too
in these fevers, the Retina has its
Vessels distended entirely round it
so that the Retina is rendered there
insensible quite round: Look to half
a Crown or any such thing you see
a black ring round it.

Amaurosis

This

66 This is a Chronical Disease, & may arise from an over distension of the Blood-Vessels upon the Retina, rendering it insensible from humours, rendering the Nerve Paralytick &c. or as I have often seen from Spasms upon the Sphincter of the Pupilla, so that a woman after a Hysteric fit could not distinguish one letter from another. This last sort goes off with the Spasm. Lastly an Amaurosis happens to old people from a more rigidity & Consequently Insensibility of the Nervous fibres, Sympathy of the Retina and Uvea. This Sympathy is not owing to the Ophthalmic branch of the 5th pair of Nerves being spent on the Uvea and connected to the Optic Nerve in its way — In the same manner from the branch being spent on

the

the Membrane of the Nose and Eye,
il is owing that we Sneeze coming
from a Shady Chamber into the Sun-
The large 5th pair of Nerves arises from
the Annular Process, and ran close
with the 6th so that they are difficultly
separated, & there are some fibres betwixt
them that would look like a Connexion
tho I believe there is none, but what
Cellular Substance makes, when il
pierces the Dura Mater il divides in-
to 6 branches. The first is the Ophthalmic
which sends Twigs into the Intercostal,
the membrane of the nose, Forehead,
and the fatt membranous Glands
of the Eye; this makes the strong —
Sympathy that Subsists betwen the
Optic & 6th pair of Nerves &c. If the
Retina admits any Rays of light
thro' il, and this I think il does is

evident

evident from looking at the Pupilla of Animals, where the Colour of the Retina is always corresponding to their way of life or the colour of their food, as Cows, Sheep &c. have it greenish or somewhat brownish. Cats Owls &c that take prey in the dark have it white, so as to reflect any Colour or rays. The Chyroid Coat that are supplied plentifully by the Opthalmic branch will be stimulated by it, and by the Sympathy of that, with the Twig of the same branch that goes off by the Intercostals, the Muscles of Respiration are brought into Contraction by too great a quantity of light, or what we call Sneezing is brought on, which always happens to every person exposed to too great light. The same sensibility of the Chyroid Coat serves in part

also

also to Stimulate the Retina to a Contraction to exclude more Rays of light than is convenient Some think this is merely an action of the mind from the advantage we reap from it, but I think there is first a Mechanical Cause that brings us to the regular habits of doing so which afterwards becomes Customary; for I am certain there is no Volition or act of mind in several other Phenomena brought about by the Sympathy of Nerves, when any one branch of them is irritated. The distribution of the Ophthalmick branch of the 5th pair to the Eye membranes of the Nose, forehead & Eye lids explain how all these are affected so violently in this Disorder.

The pain I describe from Experience, having had some years ago a Periodical Megrim, that seized me at Eleven

7° O'Clock every forenoon, and lasted till
6 at Night, with such violence that
unless I was constantly rubbing
the Ball of my Eye & Superciliary
Foramen I could not speak a word
till at last being in the Winter time
I was obliged to give up my Lecturing
and being confined to take the Bark
in large Doses, but first thought fit
to take a Vomit not expecting any
relief from that: however first letting
Blood, in order to prevent the Vomit
from doing any hurt/as I always a-
bound with Blood/ my Vomit which
was Tinct: Ipecac: 3i, puked me strongly
about 20 times and purged me 40
times/ Vomits constantly use me
in that way merely by provoking a
flow of Bile into the Stomach and
Gulls/ - After this Fever had the
Scarlet down of the Megrim, so that
my

my cure was entirely accidental. —
If it had not so quickly gone off, I
was to have applied a strong Blister
all over my head and used the Bark
directly, which I would advise in some
Cases that are similar, but since that
time I have cured numbers by only
giving them strong Vomits and a
Purgative two or three hours after
the Operation of the Emetic if that
does not answer for both. — This
method is probably fullest, where there
is a Plethora, or the Stomach is overloaded.
If this disease had arisin from Spasms,
as it very often does in Ladies, volatile
Spirits are very proper, for these Stim-
mulating things, such as Salt Volatile
Aromatics &c. tend greatly to remove
the Obstructions of the Nerves, hence
in diseases of the Eye, where Snuff
does Service, lis more from the Sympathy
betwixt

belvial the News of the Nose, than from any Evacuation made by the Nose.

Arteries of the Brain

There are three ordinary mistakes about these Arteries. 1st We are commonly told that the Arteys are broke down into a number of small Vessels in coming thro the Cranium from the Skull, then unite into one Trunk, in order to break the Impetus of the Blood before it get at the Brain, but this does not happen in Brutes, where it might be thought more necessary. 2dly That the branches of the Carotid Artery in the Brain forms Circles as upon the mesentery by their large Anastomosis. This favoured Boerhaave's Opinion by him greatly, but there

are

are no Vessels in the Body without ſom 76
Anaſtomoſis excepting the Capillaries
3dly That the Arterys within the Brain
are deprived of their muſcular Coat
but they have it in proportion to their
Sizes as well as any Arteries.

Pulsation of the Brain
I hinted to you once already the absurdity
of that Italian Chimera of the Dura
Mater being the Primum Mobile
chiefly supported by Baglivij and
Pauchioni of the Animal body; and
the Objections I gave you were, the uni-
verſal Connexion of the Dura Mater
to the Skull. This shews when the Skull
is entire, there can be no motion either
of the Dura Mater or of the Brain, and
there is an Experiment by Ridley,
whereby we are certain that this Pul-
sation is no ways owing to the Starling

of

7A of the Dura mater, for taking off a piece of a Dog, shall the same Pulsation was equally evident the Vein contracting & getting out as before, perhaps you will think it strange that after all I advance that this Systole and Diastole never takes place in the Dura mater or Brain but when the skull is wanting, yet I think will appear evident. We know from the Experiment of Cupping Glasses, being put upon any part of the body, and from the Animals inclosed under the Recipient of an Air Pump, or any Experiment taken from the pressure of the Atmosphere, is taken off that Air contained in the Liquors of an Animal is greatly an over balance for the Contractile power of the Vessel; for by a Cupping Glass the red Blood may be brought at last thro' the entire Vessels of the Skin, and in the Air Pump the

Creature

Creature at last bursts. But when the External air is admitted, it exactly Counteracts the Internal air, & may be supposed both absent, as they mutually destroy each other. Now in considering the Brain we find it secured of the action of the Atmosphere by the Skull as if it were under the Receiver of an Air-Pump, so that nothing remains but the External air, which must now distend the Vessels of the Brain till they come in Contact with the Skull, so that the Vessels of the Brain must be in a constant state of distension, that the Liquor may circulate thro' them in an easy way without any disturbance from the External Air for all now is in Equilibrium.

As soon as a part of the Skull is removed in Children where it is not ossified, the Atmosphere acts upon the Brain, & must occasion this alternate motion

from

from impelled Liquors, & the contraction of the Arterys again. Hence we may account for first the alternate motion of Sleeping & Waking for when the Nervous fluid is so much laid out on the animal Functions, that a Sufficient Stimulus upon the small Capillaries of the Brain is wanting then the animal falls gradually into Insensibility but as soon as this stimulus has continued long enough all these small Vessels have recruited enough of their fluid (for it is subtiller than the air itself) from the larger Vessels, then the Stimulus makes the animal. 2dly How Children are more subject to Convulsions and affections of the brain than grown people, having their Bregma not Ossified, & consequently the Circulation is not equal. 3dly How Lethargies, Apoplexies &c. form a Collection of Water in the

the Vesicles of Hydrocephalous people
whereby the small Vessels are compressed
and consequently the Nervous fluid
not secreting or transmitted by rubbing
strongly on that part of the Chin where
that Nerve comes thro' the External
hole of the Jaw Bone we seldom miss
to cure the Tooth-ach of the lower Jaw
for some time, that in the same way
rubbing upon the Superciliary hole of
the Frontal Bone ease the Megrim,
Viz. By diverting the attention by a
Stimulus upon another Branch of the
same Nerve — Mr. Monro thinks that
burning the Nerve of the teeth with a
hot Iron in Tooth ach is seldom or never
can be done on account of the Saliva
extinguishing the small Iron, and the
risque of hurting the mouth, so that
the Operation scarce needs to be tried,
for he says, the Cavity in the Teeth
is

is always full of Saliva before we can get the Iron into it. — If you meet with an obstinate Ulcer in the Cheek, lower Jaw, or there abouts tho' never so small or trifling like, be sure to inspect the Teeth, and if you find any of them Carious or beginning to rot, Extract such a tooth directly, otherwise dont expect to heal the Ulcer.

At Leyden a Comrade of mine had dealt a long time with M^r. Boerhaave, and Surgeons he had recommended to him, for an obstinate Ulcer, but small in his Cheek, but had never turned better by any sort of Application. I happened to ask a sight of his teeth, and finding one of them rotten, tho' it had never given him any uneasiness, I desired him to ask M^r. Boerhaave if pulling that Tooth might not contribute to healing

the

the Ulcer. The Doctor, who was the
readiest Man in the world to own his
Oversight, immediately asked the
Gentleman's pardon, and told him that
was the cause of the Ulcer. The tooth
was drawn out, and the Ulcer healed
in a few days. This was the first In-
stance of the necessity of considering
the teeth in these Ulcers that I met with.
In Edinburgh a Lady of Fortune consul-
ted me about a small Ulcer near the An-
gle of the under Jaw, and upon finding
that she had a tooth somewhat spoiled,
which used sometimes to be the Seat of a
Tooth-ach, I would apply nothing till
that should be pulled out, but her people
were afraid that her Ladyship would be
disturbed about such an operation, so
she Employed several Surgeons, every
one of them promised & undertook to

cure

cure such a trifle, but as certainly all miscarried — She was Blooded &c tried Moffat Wells, got Mercury, and after a year or two went to Bath, when a Surgeon promised to heal the wound in a few days, she told She was very glad I should be disappointed, for that I had asserted it could not cure till a tooth was drawn. Then says the Surgeon that is the very thing I want done in the first place without which I'de never dress the Ulcer. He pulled the Tooth and healed the Ulcer in a few days.

There is such a Communication betwixt the Organs of taste & Smell that take away the one, and very little of the other will remain.

A Vintner in London engaged to tell me merely by his taste, tho' his Nose and

and Eyes were shut whether you gave him red or white Mountain Wine, and that no less than 20 times running, but he failed the very second time of trial. But a Gentleman without nicety of taste gained the Wager, for he told true every time, but it was from this that the red wine made him like to Vomit whenever it touched his Throat. — We very often find the side of the head or the Ear more affected in the Toothach, than the Teeth themselves; this is owing to the Connexion of the Dura Mater with the Superior or Inferior Maxillary Nerves.

I had the care of a Young Lady, who sometimes had Toothaches, she was seized with a most Acute pain in one Temple, but without pain in her teeth, yet as this pain continued in

spite

spite of all applications, I was of opinion it was from the Teeth and proposed pulling it; But her mother would not allow till the Girl was almost distracted with pain, and was positive to pull the tooth, which was no sooner done than she was cured in a moment, and such was her fortitude, that she patiently suffered the Extracting of five other Stumps without Complaining, rather than run the risque of the former pain, which never returned. —

The strange effects of hot Iron applied behind the Ear is something very surprising; The most remarkable Instance of this was in a man, who after a Tooth Ach was seized with such violent Convulsions & contortions of his Lips as soon as he attempted to open his Mouth, that he durst not venture to speak

speak one word, but he was obliged to
clash his hand on his mouth & rub his
lips violently to settle the distortion
again. He tried many things but
meeting with an old Physr here, who
had been once a Garrison on Holla
la Charile and often employed in
Cauterizing the Patients Ears for the
Toothach, promised the man an im-
mediate cure, and indeed was as good
as his word, by only Searing the cross
Bar of the mans Ear, which is that cross
rising which runs just above the
Meatus Externus. I have seen many
such Instances since, and I take the cure
to be merely produced by the surprise and
sudden Stroke, for I always observed the
more dreadfully the Pat: conceives of the
pain before hand, and the more suddenly
you burn the more evil is, and beside it
seldom succeeds twice with the same

Pat.

84 Pal. for these know what a brisk ail is;
therefore I generally show them the red
hot Iron without the Sheathe and
makes them think to be severely Burnt.
I fancy it does not matter whether the
Iron is applied, if not too far off on the
Antihelix or behind the Ear &c. The whole
operation is to singe the Skin we only raise
a Blister. It requires no dressing or
Ointment.
Blistering behind the Ear &c. I take it
to resolve the Spasms of the Nerves of the
Teeth, in the same manner by the same
Irritation, and not by Evacuation;
So that the only difference in the Ap-
plications of this kind is the sort of Sti-
mulus you apply, and the stronger
it is, it promises the more success; tho'
all these frequently fail, yet as they are
innocent, ought to be tried. — There
must be a great Sympathy betwixt
Vomiting

vomiting and Coughing, as the same Eighth pair of Nerves serve the Lungs and Stomach, so immediately if one is Coughing severely, and his Stomach only become affected, his Cough abates directly, or by a tickling we Cough in the very time of an Emetic working, its action is commonly stopt.

Asthma —

I only define this Disease to be a laborious Respiration from an unknown Cause, for where the Cause is manifest, I no longer call the disease an Asthma, — Thus a Pleurisy, Peripneumony, Hydrops Pectoris &c. the very difficulty of breathing proceeds that would be called an Asthma if we were ignorant of the cause of it. — The Asthma arises from a variety of Causes. What is called the Pituitous Asthma is owing to the Collection of

mucus

mucus in the External part of the Pulmonary Vessels. This is distinguished by the rattling Noise of matter in the Patients breast (tho not in the beginning) and difficully in distending the Lungs in Inspiration, and in this Case if the matter is not already Concocted (that is if it does not render it fluxile enough to be pushed into the Cellular Substance of the Lungs) hence Coughed up) we may order attenuating Medicks but the chief stress of the Cure lyes upon Emeticks properly given, but if given, while yet the matter is impacted, they will confirm the obstruction much more, give immediate hazard of a ruptuure of some Vessels, or at least fix — readily a Phthisis, Pulmonalis —

If a Vomit or two be given when the matter is Concocted, the Contraction of the Stomach Squeezes it up in great quantities

quantities, and immediately relieve
the Patient — We will know the
jundure when to give the Emetick
when we perceive the rattling Noise.
2dly Another sort of Asthma proceeds
from confirmed hard Obstructions
in the Glandulous Contexture of the
Lungs. This commonly appears when
the Pat. is between a Galarth and Con-
sumption, the Breathing here is as
difficult as in the last Case.
3dly When an Asthma proceeds from an
Hydrops Pectoris, we discover the Patient
feeling a weight upon any Side he lyes
on, by which falling to that Side, while
he breathes pretty easily with the other
Side of the Lungs.
4thly The Nervous asthma. This is a
sudden difficulty of Breathing with-
out any great disorder or pain, but
that same, & goes off as suddenly, or

continuing

continuing a time we can away by spilling up thin Viscid Phlegm. This disorder cannot be from any sudden obstruction, as both ceiz a and forsakes the Part instantaneously whereas the difficulty of breathing from obstructions increases gradually, and have some other Diagnostic Symptoms that show some other Cause, such as Pituitous humours, water in the Cells, Inflammation of the Lungs or Pleura, Swelling of the Bronchial Glands &c and are each of them to be treated according to the nature of the Disease, but the Nervous Asthma being plainly a Spasm in the Lungs is to be treated with Nervous Antihysteric Medicines such as aqua Fraida Castor Sal ammon. Blistering &c. to take off the Irritations. It sometimes goes off by a Spilling of Viscid humours from the Lungs: This is a Cure prepared by nature for this disease,

for

for the Irritation is often occasioned
by a dryness of the Lungs, by which
means the Piluitous humour is separ-
ated, that softening and Lubricating
the Vessels cures the disease, by the help
of allenuating and Antihysteric meds.
Tho a Vomit may appear very necessary
in a Nervous Asthma, I desire you to take
care, you dont give them indiscrimina-
tely to all, for when the Action of the Vomit
comes, I have seen the Throat Glottis and
Lungs so Stimulate with a Spasmodic
Contraction as wholly to exclude the
air from the Lungs, and almost kill the
Pat.t so that you will do well, first to
make them drink warm water and
Stimulate the Fauces with a feather, to
see whether they can bear it. This you
ought always to do, before you Venture
a Vomit to Asthmatic people. But
4thly There is a sort of Asthma I have ob-
serv'd

observed as frequent as any other or more so, This is a kind of Low phlegmatic in y^e Lungs or a Collection of more Watery matter impeding their easy motion. This Asthma I found nothing cures so effectually as pretty brisk Doses of Physic, which carries off this Watery distention by the Intestines in the same way as in any other part of the Body, This Asthma with a Scantiness of Urine is often cured by a large flow from the Kidneys

Chincough

This is properly a disease of Children, and never have but 4, or 5 grown persons have it. It sometimes rages Epidemically among young Children, as the Small Pox &c do in certain Seasons, which Infectious disease is owing to certain Particles floating in the Air, entring our Bodies and

and making the disease. But what 91
these Particles are that produce these
Infectious Diseases we will never
know. I believe only that such & such
Particles find a proper receptacle for
themselves in different parts of the
Body & so are productive of different
Diseases, now we must confine ourselves.
In this Disease, some think that there is
mucus thrown out upon the Lungs.
In the Chincough & Nervous asthma the
Spasm is communicated to the Muscles
of the Larynx and often so throughly that
there is the greatest hazard of Suffocation
from the Constriction of the Glottis. —
Every one knows that Children in the
Chincough make a Squeaking noise
like a Cock crowing: This is occasioned
by the Glottis being then Contracted.
This Sympathy of the Branches from
the Eighth pair of Nerves is the plain
cause

92 cause of this, by the Air being denied Egress it ravifies & dislends the Lungs, whereby the blood is retarded in the descending Cava, at the same time that the Organism upon the muscles of the Thorax compress the Jugular Veins whence the blood is accumulated with the Cranium and in the External Vessels. From the first follow the Pugnant Convulsions, and other Nervous Symptoms in the Chincough, and a good reason why this disease seldom misses to prove fatal to Children that are not above 3 or 4 Months old, by distending the Vessels of y^e Brain and occasioning an Apoplexy in these young Patients, where the Solids have not acquired firmness enough to Counteract the Disease — From the distension of the External Vessels we find the face in violent Paroxysms turned purple, livid, or even black, and commonly

commonly kills the Patient unless some branch of a blood Vessel breaks open and relieves him, or the Spasms leave the lungs & Glottis and seize on the Stomach & so excite vomiting. It is commonly and justly observed that those Children who bleed at the Nose in the Fit seldom die of this Disease especially if the Ocular Artery, I spoke to you of some days ago, burst it will give Vent to the Blood from the Brain that perhaps would otherwise form Obstructions. — There are so many Specifics for this Disease, that every old Woman thinks herself possessed of one, but I believe they are of little Service. Some propose Asparagus Roots others Camphire &c for the Cure of this disease, and I have often seen these Specifics, as they call them, cure the disease but then I was going off however, no no thanks

to

9 A to them — The Disease will have its
course in Spite of Incd.s and if it attacks
in Autumn seldom cures before the
warmth of the Ensuing Summer or
Spring, it will go off in June or July.
The heat of Summer likewise cures
the Disease. — Take the Phys.n great care
business to be, to keep the Vessels empty,
that so there may be no great danger
of Suffocation so likewise will prevent
Obstructions in the Lungs, as also In-
flamm.n & suppurat.n and prevent
the Blood from going in too great
quantities to the head to form Obstruc-
tions.

The Indications of Cure in this Disease
are to Evacuate the morbid infarcted
mucus and to quiet the Spasms. The
first is answered by Purging which
is the principal thing in all these
Diseases by Purgatives. The second
is

is answered by Stimulus's so as to
affect the Nerves at some distance.
The most proper Stimulus is Vesica-
tories which are commonly applied
between the Shoulders, but from the
Connexion betwixt the Intercostal
Nerves & the 2d. and 5th Cervicals I
chuse in such Cases always to apply
a Blister along the side of the Neck,
and if I am not mistaken they succeed
better than those applied between
the Shoulders. the reason is from these
Nerves, for I take Blisters to be of very
little Service on the Chin cough if you
only consider the Evacuat. they make
but can Irritation made upon a remote
part we know tends to remove any
Spasm from the part affected. If the
Pat. be plethoric V. S. easy digested
food, and Expectorants help to throw
up the Stuff & to attenuate any ob-
structions,

96 Obstructions, as Squills, with Syr:
De alth: these lubricate the Breast
ease their Irritation, & likewise
cause them puke gently, whereby
the Matter will be thrown off in
great prosecule these Intentions,
we must consider that the most
violent Symptoms often proceed
from the weak soft Contexture of
Solids, and their great Insensibility
in those Infants, and endeavour to
cure it by mild Strengthning Med:
principally frequent Doses of Rhu
barb, which will likewise be of Servic
from its Purgative quality, hence we
see how absurd the ordinary practice
of giving Unctions & Stimulating Mix
ts, for by their oily nature they relax
the Vessels more & by their Stimulus
already applied already to the Nerves
in any Organism they excite still more
violen

violent Spasms. When the Disease is
gone off if the Child is brought very low
by it, Asses Milk or such like Strength-
ners will be proper, when disagreable
food or such things as the Pat. has an
Aversion to, taken into the Stomach produce
a difficulty of Breathing, Vomiting Stretch
ing of the Glottis &c because the Sympathus Ner-
vosum is in general affected, & particu-
larly the Lungs & Stomach by something
to which the Nature of the Person has
an Antipathy, and so Convul
Why has the Superior Orifice of the Stomach
been esteemed by some the Seat of y^e Soul?
Because of the great Plexus of Nerves of
the 8^th pair that every way is bestowed on
it, and gives it such a quick Sensation—

Vomiting in the Asthma
At the same time that it is most In-
dicated, it must be Excited very
Cautiously

Cautiously, for from the Sympathy
betwen the Recurrents that serve the
Larynx in a good measure & the Nerves
of the Stomach both arising from the
8th Pair, the Glottis is sometimes so con-
structed and the Contraction Commun-
icated from the Stomach to the Glottis so
violently, that Suffocation is immedian-
tly hazarded.

A Lady who had an Asthma from a
Collection of Phlegm in her Lungs —
took a Vomit by my direction, as soon
as it began to operate I was sent for,
and found her reaching to Vomit, but
could not get it further than her Throat
her face red and distended, and tho'
not able to fetch an Inspiration; —
however at last she got Vomited and
was immediately eased nor subject
to her Asthma for some time after. —
However when it returned again she
insisted

insisted strongly upon getting a Vomit,
so that I was forced to allow it almost
against my Will. No sooner felt she
inclination to vomit than all the former
Complaints subsided, and to a much
greater degree, for her face turned livid,
She lay Breathless and without motion
for a little, till I believed she was just
Expiring, and I was just ready to
push a Lancet into her Jugular Vein,
(no otherwise I could not have bled
her;) but she timeously recovered to prevent
me, and since that time would not, nor
ever will give her another Vomit. —
When it is necessary to Vomit in asthmatic
Cases, who should never order the rough
Emetichs as Emetic Tartar or Antimo-
nial Preparations, but only the milder
kind as Oxymel or white Vitriol &c.
There is one thing I would particularly
recommend is the regard to the Pat.s Con-
stitution

Constitution and one thing I would Caution against. Viz. Giving Ipecacuan to Asthmatic Patients, for this Powder no sooner touches some Peoples Throats than it gives them an asthma and I fancy never one of you powdered Ipecac: without feeling for some time a load and oppression upon your Lungs, that the powdering of no other Substance ever occasioned, and I dont know in the Ladys Case I mentioned, but the Ipecac: was the thing that produced these Violent Symptoms. —

I know another Gentlewoman an Apothecarys Wife, who for several years after being married, laboured under an uneasy & Constant difficulty of Breathing, that she knew no cause nor could find any cure for. accidentally an old Phys. came to Vomit her, who as soon as he entred the Room, was seized with a fit of the asthma

and

and recovering asked if there was any
quantity of Ipecacuan in the Room, they
told him, not, but that they were pounding
it in the next Room, on which the
Phyn telling them that the smell of Ipecac:
still affected him in that way. The Gentle
woman imagining her Asthma might
be from the same Cause since that time
the Apothecary having allowed no
Ipecac: to be pounded in his house she
has never felt the least difficulty of
Breathing.

People of lax weak Stomachs scarce eat
any thing of difficult Digestion without
having Spasms and the Sensation of
a Ball in their Throat & Breast.

This distension proceeds from three Causes,
either the Air discharged in great quantities
from Victuals being kept in the Stomach
degenerating for want of sufficient
Strength in the digesting Organs or in

Air

air detained by Spasms of the Stomach and ariseing by heat. By this Air pro:duced by either of these ways & dilating itself, the Stomach is distended and as its Neck is fastined to the Oesophagus — where it passes thro' the Diaphragm there is an Angle made upon this part, & the Fundus of the Stomach turned outwards So that sometimes we can feel the Air escape upwards, it dilates the Oesophagus & by this distension excites Spasms here, it is catched betwixt them, presses upon the linings, Trachea or Glottis according to the part of the Oesophagus where the Spasms are produced and the different Sensations more or less Suffo:cation.

A Lady a Pat. of mine subject to these distensions I ordered some Billers with a little Mace designed for Cherishing and warming the Stomach She no sooner took

ook the first Dose than the Spasms and
distension Seized her so violently that
they concluded her dying. — I was called,
and found her in a very bad Situation, & did
not know what to think. As soon as she re-
covered so well as to be able to speak, she
told me that she used to be in this Situation
after eating Broth in which Mace had been
boiled. I immediately asked her pardon,
and told her there was Mace among the
Pillers. Then says she, be not uneasy, for
I shall be well immediately & getting
warm Water she Vomited and was quite
well directly. ——

Croup.

This is a disease in the Country to which
Children are Subject, and which is very
fatal; It has no Technical name, only
it resembles the Nervous Asthma. The
Country People call it Croup. — It affects
Children

Children commonly the most healthy and affects them with such a difficulty of Breathing that they can't speak a word nor not so much as Cry, they breathe strong and full with a Squeaking noise thro' their Throats. This is a disease very treacherous, for the Child recovers very soon again, and appears quite well but dont trust them, for if they are not Blooded Physicked and Blistered as the Circumstances require, they generally die in a few days. Fowls, especially Hens are subject to something Similar to this.

The Nervous Accessorius passing thro' and serving the Mastoid Muscle is spent upon the Cainsoid & Trapezius, and hence in Swellings of the Amygdala and where the Sternomastoid Muscle is affected we find no acute pain upon the upper and back part of the Shoulder, and the head is drawn to that Shoulder,

which

which relaxing the Nerve somewhat, 105
the pain is easier. — I have affirmed that
the Recurrents are cut, if the Superior
Branches of the 8th pair be safe, the voice
will not be entirely lost and tho' Dr. Martin
says so much to the argue the contrary yet it is
plain in all his Experiments that the
Animals if pinched or pricked Screamed
so as to be heard very well at a considerable
distance —

The 8th pair of Nerves is the largest, and
most generally distributed, of the Head,
and form a number of Organs that lie
is bestowed on, viz. The Larynx, Pharynx,
Trachea arteria, Fauces, Oesophagus,
Stomach, Lungs, Pericardium, Heart
and other Bowels in the Thorax and
Abdomen, we may Explain several
Phenomena, Viz: 1st Why the Voice wind
is wholly lost, when the Recurrent Nerve
is cut; That this is the Case I appeal to
the

the Gentlemen themselves who made the Experiment, and who would have it that the Voice is wholly lost in Animals that have the recurrent Nerve cut. But at the same time they inform us, that the Dog and Sow on whom it was performed, both had a sort of grunt Voice, tho' indistinct. Now I say that any voice whatever from their Throat was a plain evident proof that they have some voice remaining, the reason of it is that the Larynx is supplied with a Twig of the Superior Branch of the same 8th pair that reflects the recurrent & if the Animal lived till Nature got time to supply the deficiency, I throw not but a good part of the voice might be recovered by this Nerve

2dly Why tickling the Fauces &c — Because both the Fauces Oesophagus & Stomach are supplied from the same pair and when the one is irritated, it draws the Stomach into

into a Convulsion by Sympathy.
3dly Why vomiting is Excited by Coughing
&c. — Because the 8th Pair afford the Lungs
& Stomach Sense when the one is Convulsed
& irritated, the other is easily brought into
the same State, in so much that the Spasms
forsake the part they first seized and attack
the other. Thus I have seen the Operation of
Vomit diverted by a fit of Coughing
a fit of Coughing relieved by Vomiting.
4thly Why in a Nervous Asthma or Chincough
there is such a difficulty of Breathing
and the Patient inspired with a Crowing &c.
Because the Spasms that affect the Lungs
in both these Cases convulse the Nerves
of the Glottis by Sympathy, and bring it
to a State of Contraction, by which the
Chanel are so Straitened that not enough
of Air is admitted to dilate the Lungs,
and what is comes by such laborious Efforts
of Inspiration as makes the kind of Crow-
ing Noise ——————

Cholera

Has its name from χολος Bilis. — It is a disease where from anyone cause, the Biliary Ducts have been dammed up, the Bile accumulated in its Bladder, & on that Account is grown more Animalized and Acrid, the impediment is now taken off, the Bile not only very sharp, but in large quantity is poured out upon the Guts & must occasion strong purging. — This Irritation on the Guts, by the Connexion of the Nerves of the 8th Pair & Intercostals — affects the Stomach & produce Vomiting. This Sympathy is very Convenient, therefore when the Bile is not pumped up, and vomited, being much sooner cast off it has a long way to travel thro' the Guts. — acquires greater Acrimony by the way, & has much longer time to act, producing vomeliums as violent Symptoms, hence the Indication is to invite this offending

Bile

Bile to regurgitate by the Stomach this
we do first by warm Water drunk in
large quantities & provoking the Pat.
to vomit. This I have cured it very
often; for not only does the warm Water
fetch up a great quantity of Bile by Vomit,
but also dilutes & renders milder what
remains, and this gives us another hint
to the cure, to oppose the particular Acri-
mony of the Bile & make it less pungent.
Thus we find gentle Acids are very Beni-
ficial and juices of Fruits, or even some
drops of some Acid, Spirits, for the same
reason it is that such things as are only
Accessarl are found so proper. Thus Toads
and Water & such things. We dare scarce
venture to give an Emetic before the dis-
ease has advanced any length, & even
then they must be very mild & opposite
to the disease. This Oxymel may tim-
ously fetch up the Bile before it has

come

come thoroughly to Action, but in the violence of the disease we must give no Emetic: in the end of the disease we may assist nature in Expelling the remains of the Bile by a Gentle Stomachic Purgative.

Colic

This is a disease that requires the most accurate Observation, and Caution, for as it proceeds from different Causes, the methods of Cure are Diametrically opposite. — It will be of Salutary nothing is oftener tried than a Dram, or a little Pepper, But then if the cause should be inflammatory these are the most direct Poison, and I have seen their Effects in a few hours.

A Country Gentleman was seized one Night with a Severe Colic, from an Inflammation of the Intestines, he rose out of Bed and

and got a Dram after which his pain increased immediately, so that next day I was sent for, and when I reached his House it was only about ten hours from his being taken ill. — He told me he was pretty easy and hoped to be well very soon, but upon feeling his Belly quite tense, his pulse Sunk & Intermitting and the pain tho very dull yet fixed. I told him that he was a dying. The Gangrene was already come on, and indeed he scarce lived an hour longer — And you must always remember that there is a Speciality in Inflammns of the Viscera that remarkably distinguish them from any other part of the Body, to wit, here the Pulse is always low and weak, and in other Inflammns it is strong full & hard, so that you must bleed till the Pulse give.

I have bled them to 4 or 5 lb. in a day beginning

112. beginning with a pound, but in other Inflammations you must Bleed till it Sally. — The lowness of the Pulse attending Inflamed Viscera proceeds I suppose from the Sickness, Nausea &c. that always attend any Irritation or Stimulus of the Intestines or Stomach, so that when the Pulse rises, it indicates this Irritation is diminished, for till this is undone it wont rise. So that your only method is to Bleed repeatedly and plentifully, or lose your Patient. There is no Inflamm.n I know of that so quickly advances as these in the Intestines or so fallacious to young Practitioners, for in all Inflamma.ns of the abdom.l Viscera especially the Intestines, you must trust the Pulse, as in other Fevers, for the lower the Pulse is, the higher generally is the Inflamm.n, for there is always a Nausea and faintishness attending it, from the Sympathy

Sympathy among the 8th pair of Nerves & Intercostals; That the Arteries are affected with a sort of Organism, and cant be dilated by the Impetus of the Blood.— However you are to take your Diagnosis in this Case from the oppression and Nausea from the Quickness of the Pulse, and fixedness of the pain in one point; Then to reap every advantage you must bleed and that in a very large quantity— Bond be timerous from the Pulse but let Blood till by emptying the Vessels, the Spasms are taken off their Muscular Coat, and the Fever turn natural by the Arteries yielding to the impulse of the Blood, I give my word if you persist, and the case be an Inflamma? taken timerously, the Pulse will rise upon repeated bleeding and tell the Pat. have a lowness of Spirits for two or three days than loose him entirely.

The

11A The 2d. Species of Colics, are those commonly understood by Colick, the distention of the Intestines from Air, and the Consequent Spasms owing to Air contained betwixt two Spasmodically contracted parts of the Intestines — These are distinguished from the Flatulencies that proceed from the habit of the Body, but especially that the Pulse is not at all moved, and are commonly cured by Stimulating Antispasmodical Injections, with Gum Asf. Solid: some Diascord & dissolved in them, & injected pretty cold, that the Pat. may retain, & let it always be a rule, that when you want they should be soon discharged give them pretty warm, but if with a design to retain them any time, let the Clyster be always pretty cool. — By this method the Windy or Nervous Colic is Cured.

The

The 3d. Species of Colicks, where there is some acrid matter lodged in some of the Cells of the Colon &c or from Excoriation there. This is distinguish'd from the Windy or Inflammatory one, by its obstinacy to the ev remedies, that are only adapted to any of the former Species, and is bas'ned by Injections of Milk and Water with some Diascord, if severe, and always Vitellum Ovi mixed with it, thrown in so forcibly and with such a Spring as will make it go thro' the whole length of the Flexor of the Colon, and by that means make a solution of the part, and give after it a gentle Lenient purge — I have cured many Dysenteries of Several Weeks Standing with severe pain by Injections of Milk & water ℥vj with ℥ij, of Diascord.

I think there is a 4th Species of Colic from Concretions of a soapy sort of Stuff in

in the Guts, this is not very common. I have made the Prognostic & after death found it true, the Cause of this I dont yet well know; The cure depends upon regulating the Body so as to force it down the Canal, if there be any Cure for it. I tried one particularly with Clysters and an Acrid Purgative afterwards, but to no purpose.

In all Cases of these Colics, where the pulse Indicates the least Inflammation or even tho' none at all, V. S. is to be performed, as in either Case, it will do no harm, but if from an Inflammation there will be an absolute necessity for it. —

Inflammation of the Liver &c. —

The Lungs Liver and Spleen, when Inflamed dont discover it by the Acute Sensation which we feel in either parts, for we find that these Organs have a much less Acute

degree

degree of Sensation than other Viscera.
This perhaps is owing to the singular
softness which all the three have. From
this we are not to expect the Pat. will
Complain very much.

In the case of an Inflammation of the Liver
or Spleen, we have the same Nausea,
Weakness and Looseness from the warmness
& Sympathy of the Stomach to guard against
as in the Case of Colics, but there is a par-
ticular reason why the Pulse is always
low in such Infections of the Liver for there
we have almost lost the propelling force
of the heart, as the Blood is in its second
Circulation hence the Stimulus must be
much less, and the Inflammation more
tedious, we are to trust to the quick Pulse,
fixed dull pain, and probably Nausea
Vomiting &c

Biliary Calculi —

Wherever the Biliary Ducts are Stimulated
much

much by Inflamm?. Yet it is no wonder if the Pat. Sh? Vomit directly from the great Sensibility of these Ducts and the neare Sympathy and Connexion of the Intercostals which serve these parts with the 8th pair that goes to the Stomach This Sympathy is very Convenient & the fittest thing in the world for curing most affections of the Ducts, for wherever they are disturbed with Inflamm?. & they are Obstructed with some strong Concretions wonly lumps or Slimy matter blocking them up. These Calculi are the only cause of a Jaundice and when very little Suspected.

There is an Anonymous Paper in the Med: Essays (probably the Gentleman own) where I think it is shewn that Inflamm?. or Obstruction of the Liver never occasioned a Jaundice, & there are Cases of Liver wholly Schirrus, where no

Jaundice

Jaundice was brought on. — It is a
wonderful one how that way these Calculi
can be thrown out, for I have seen some
of them passed by Stool, from Pat.s in
the Jaundice as large as the point of
one's finger or Thumb —
These must have passed thro' the Ductus
Cysticus in a manner contrary to its
own gravity, but how shall you lead
thro' a passage so small and full of Rugæ
that wont admit a small Probe thro' it
and as I observed already, vomiting is
the best Method to throw out these Stones
provided the pain be not intense, or the
Stone so Compacted and large that it
cannot pass — where the pain is very
acute we must never venture to give
Vomits in the Jaundice for this is an
infallible method to produce or increase
an Inflamm.n In the cure of a Jaundice
in General, such Whimsical Med.s as
Yellow

yellow Coloured are mere nonsense, tho' very long in Vogue. In a Jaundice proceeding from the preceeding Causes all your Farrago of Resolvents are absolutely good for nothing, as Soap & aloes: Indeed as far as the cleanse the Prima Viae & by their Acting on the Guts communicate a stimulus to the Vessels, they may in general be of use, gently expelling the Calculi from the Ducts in spite of a Jaundice for this Cause, or in case of a Stones sticking in the Kidneys or Ureters. But there is one Circumstance absolutely necessary, if we want the Concretions Expelled and that is to relax the Vessels sufficiently, that they may slide easier out, and the Ducts be less subjected to Spasms and Irritations: This circumstance, is of principal one in the cure, and nothing is better to bring it about than drinking plenty of Whey for two or

or three days and using the Semicubium.

I use an uncommon sort of Practice very often in Jaundice, whereby I often succeed in Cases Obstinate & all other Methods or Medes — I give the Pat. abundance of Whey to drink, or some such diluting Liquor, after this a very strong brisk Purgative, about the time it is to operate, I cause inject Zi of Soap, dissolved in a large quantity of Whey and that I instant put the Pat. into the warm Bath desiring them to retain the Injection as long as possible. When the Purgative and Glyster operate which they should do very soon, he must not remove out of the tepid Bath, but must put up with a method not entirely Elegant to be related. By this method the Pat. commonly passes some of the Concretions with his Excrements, & very often is quite easy

easy of pain and the Jaundice wears off.
The same practice holds in a Nephritis
from this Cause, only a large quantity
of diluting Liquor, perhaps somewhat
Diuretic having some Sal. Nitri dis-
solved in it, is requisite — The sooner
a Nerve sends off Branches to any
Viscera, the more subject will the Vis-
cus be to Sympathize with the other
branches of this Nerve or whatever
different Nerve this is Connected with.
This is the reason why the Calculi of
the Kidneys or Ureters much more
readily draw the Stomach into Sym-
pathy, than Calculi in the Bladder,
hence Vomiting so frequent in Neph-
ritic pains, For the same reason it is
in Women newly brought to Bed, In
Pal.ˢ cul for the Stone or any other part
of the Pelvis, it is reckoned a very bad
Symptom if the Vomiting continues;
for

for by this we know that the Irritation must be extremely great, before this Sympathy can be produced, for the 8th. pair serves the Stomach and communicates with the Intercostals, yet the Branches that serve the Pelvis are the most remote & inconsiderable of all the Branches of the Intercostals, But in the Case of Vomiting after Child-Bed, Lithotomy &c we must not be misled, for there the vomiting happens in the very time of Delivery, or in the operation of Lithotomy, if directly, we need not be afraid, for this proceeds from a Cause not permanent, Viz. The present pain & as soon as that Stimulus is removed, the Sympathy will cease, but when the vomiting continues ten or twelve days after these are over the Prognostic is for the most part false, this shews a very high Inflammation & must be treated accordingly. —

Obstruction

Obstruction of the menses, produce
these Symptoms, partly no doubt from
the Irritation of the Nerves of the Uterus
itself: But as blood not only dilates
the Cells and Vessels of the Uterus, but
also must be distributed in the Neigh-
bouring Viscera in more than ordinary
quantity, Flatulencies, Spasms of
the Guts, Borborygmi &c. that precede
the Eruption of the menses, may more
immediately be than by the Sympathy
of the Guts Stomach &c with the Uterus
itself.

Grinding of the Teeth & Itching of
the Nose, are looked upon the vulgar
universally, as certain Signs of Worms in
the Stomach or Intestines, for in Pal.
Children, that have both these Symptoms
violently, even to the day of their death,
I have cut up the Stomach & Guts from
end to end, without finding the least sign

of

of a worm all the way how ever when the
Circumstances concur with these, we
may and ought to give such Medes as are
innocent Lau Pub. Slannike or even a
little sweet Mercury, But the certain
fact is, That any Irritation of the Sto-
mach or Guts may produce this Sym-
ptom as well as worms — milk turned
Acid or any putrid Stuff in the Stomach,
or perhaps Bile lodged too largely in the
Guts. But nothing occasions the grinding
of the teeth more commonly than any thing
Stimulating the Fauces, mouth or Gums,
or a small pimple in the Throat at the en-
trance of the mouth, and Tooth making
its way thro' the Gums seldom misses
to occasion this Grinding of the Teeth,
To account how this Grinding or Itching
happens, from an Irritation upon the
Fauces, Stomach or even Intestines, I
think it is no more difficult than to

find

126 find a Cause why an Irritation of the
Nerves of the Nose, draws the Diaphragm
and abdom.l Muscles into Sympathy,
as in Squeezing the Lungs &c in Coughing it is but tracing the Sympathy of Nerves
backwards, and in either of these Cases,
the Cause seems to be the Connexion be-
tween the Ophthalmic Branch of the 8th
pair that partly serves the Nose with
the 6th where it sends off the Intercostals.
Whether this Connexion be any Continid.
of Substance or by membranes only.
It is no wonder that the almost uni-
versal Sympathy of the Intercostals &
Par Vagum with the other Nerves wh.
produce universal Convulsions, from
an Irritation upon part of the Abdomen,
when barely a Thorn in one's finger or
any other part, has produced the same
Effects.
In Hysteric Women we often find a sensa-
tion

Sensation of such vident pain, as if a Nail was driven into the forehead. This is from an affection in the first Branch of the first Branch of the 8th pair coming thro' the Foramen Superciliare, and is the same with the Megrim tho' called Clavis Hystericus only in Hysteric Women all their diseases are so inconstant & transmutable that we can't give a name to every different appearance. The pain sometimes removes suddenly into the External Muscle of the Neck from the Connexion of the first Vertebral, which serves these Muscles with the first Branch of the 5th pair. From an Irritation upon one of the Branches of the Second Cervical Nerve wch coming from the Vertebræ passes thro' the Sterno-mastoid Muscle and is distributed to the Platysmyoides and side of the Head

from

from this Irritation, whether from an Angina & the Patient's head is turned to the affected side & his Chin to the Shoulder of the other side. This the contraction of the Sterno-Mastoid Muscle directly produces, and is what they call the wry necked. Viz. Whereby the habit for some time the Pat. is incapable of keeping his head in a different posture. We know that there is not a Muscle in the Body, wch if kept in a Contracted state for a considerable time, that would turn rigid, but to whatever Muscle this Rigidity happens, if it be not Complicated with a Schirrous Tumour, Suppura? or Loss of Substance, which it may readily be in the Sterno Muscle, I never saw an Instance, where it could not be cured by gentle moving the part, backwards & forwards and moving it every day to

the

the opposite side, so far as he can bear
it without pain, continuing to do so
from time to time with friction upon
the part with some Oil or Liniment. This
with a proper Bandage bids fair for a
Cure. It is impossible these Oils can
penetrate the pores and relax the rigid
Fibres of the Muscles, for which reason
we are not to lay great stress upon them,
we may apply Poultices & other warm
relaxing Recd.— The common practice
of curing the rigidity of Muscles, by
lifting great weights, in short by stret-
ching & tearing the Contracted Muscles,
is the ready way to bring the Muscles
into greater Spasms or perhaps raise
an Inflamm?. but will never cure them.

Some Surgeons again propose for
the cure of the wry neck, the dividing
the Sterno Mastoid Muscle, where you
feel it contracted with the Sternum

by

by a tedious ending; but if these people consider that the Subclavian Artery, the Carotid & Jugular Vein by directly behind this, they will scarce venture on the Operation, for my part I never would attempt it. But besides how are we sure of the cause of this wry neck? It may not only proceed from a Rigidity in the Sterno-Mastoid muscle of the affected side but also from a weakness of the Antagonist Muscles, or perhaps from flying Spasms, or several other Causes. —

Bloodings in the Jugulars

In opening of these it is very common to cut some Cutaneous branch of the second Cervical Nerve, the Pat. feels pretty smarting pain, the Orifice commonly suppurates a little, and the Pat. feels a numbness about the part for some days, but it is of no Consequence

In—

In these the Pal: commonly Lancets the 161
point of the Lancel is broke & remains
in the Wound — I have seen them that
would not believe the Contrary till they
Examined the Lancet. This is the
vastest Vein in the Body to Blood; for
in ordinary Pals. the Carotids lyes so low
below the Vein, that with a common
Lancel we can do no mischief, tho'
we had a mind to do it —
I have often told you I did not know
what Influence the Pulsation of the
Arterys has upon the Nerves but cer-
tainly it is of some use or other, for it
is observable that there is scarce a Nerve
in the Body but some where twists a-
bout a remarkable Artery. —

Hiccup. or Hiccough

This Symptom is reckoned very bad
in affections of the Liver or Spleen, perhaps
Inflamm?

Inflammation) to be very strong, but as it is the most inconvenient motion to these parts that can be, and must increase the disease, by its Convulsive shocks it is thought so ill a Symptom in most Diseases that some have applied a line of Grammar to it that only means for Conjugating Verbs, as if it were always fatal, viz.
Singultit vult Singultum, Sepelire Sepultum

This Symptomatic Hiccup is very ordinary, and not very dangerous, in Children, it is often taken off by giving the Spirits a different turn, or some such way, Viz. Pinching or surprising the Child.

I had a Servant Girl who among other Hysterick Symptoms was excessively subject to violent and continued Hiccups & Convulsions, that bore so hard upon

upon her, wasting her Strength & 133
Spirits, that she was in danger of a
Consumption. Before I could stop
them I used Aq: Sal. Ed. V. S. Volatile
Salts, & that Specifick musk, but all
without Effect, at last applying a
Vesicatory inter Scapulas removed
the Symptoms at once. This behoved
to be merely the Stimulus upon the
Cervical Nerves, and their Sympathy
with the Phrenic, the Convulsions
having either depended upon that
of the Diaphragm, or by the Sympathy
of the Cervicals with the Intercostals,
these might be eased. —
Nothing very often contributes more
to the Cure of some Diseases, especially
where the Nerves are affected by Sympa-
thy of Branches of Nerves, Paralytick &
from their Trunks being twisted. no-
thing I say is more necessary here,
than

13A than to know the distribution of these Nerves. For instance I fell with a young Gentleman, who in a Duel received a Wound from a small Sword, in the Internal part of his arm, this was easily cured: But the small Muscle of the Thumb, Little finger, Ring finger, all Shrivelled up and he lost the use of them entirely, nor could ever take a Bulky thing into his hand. — Then on the Ulnar Nerve had certainly been hurt, and by sweating his arm in a Box with burning Spirits, and applying Nervous Stimulating things along the course of his Nerve, I recovered the use of his fingers so that he could grasp a Staff in his hand & move his fingers perfectly well, but still Numbness remained from the meeting of the Nerves of the Arm under the Axilla, we easily see

see why people from the use of Crut. 135
chez often suffer an Atrophy or Par-
alysis of their Arms; This is occasioned
by the pressure of the Staff against the
Collection of the Nerves, & may easily
be prevented by leaving a consider-
able concavity on the top of the Crutches,
and stuffing them with some soft
substance whereby the weight will
be upon the rising ends of the Staff—
In Convulsions Palsies &c of the Supe
rior Extremities our Applications
ought to be as near to the Trunk of
the Arm as may be. Thence Vesicatories
&c. serve much better by the side of the
Cervical Vertebræ, or rather under
the Axylla than between the Shoulders.
If the proper Crutches be used, the
more the person uses them he will
do it with the more ease, and his
arms will grow thicker & firmer

but

136 but if the Slaves be bad, he will gradually turn worse at walking with them. —

A Gentleman having a Sinous Ulcer in one side, thro which his Urine made its way was seized with an acute pain in that side where the Kidneys are seated. — As he had several times had fits of Nephritic pains & passed Gravel and had now a considerable quickness in his Pulse & pains towards his Loins, directly concluded a Nephritis, but when I interrogated him finding the heat he complained of to answer directly to the course of the Lumbar Nerves, along the Abdom.l Muscles & that the pain was not constant, but by fits & smarting him in the Ulcer, I judged it to be no more than the Acrimony of the Urine irritating the Ulcer, and by the Communication

Communication of the last Dorsal
with the Lumbar producing this pain
and heat, I hindered their proceedings
to V. S. by applying some Ol. succaginum
and ung.t alb to the Edges of the Ulcer &
friction along the Course of the Lumbar
Nerves he was eased immediately.
A man came to Town to take Advice
about some Tumours that he had
along the Course of the Muscles, they
felt perfectly hard 4, or 5 of them & were
soon judged to be a Steatoma, or Schir-
rous Tumour, by asking him one
question accidentally, I discovered
them to be quite different. I found they
sometimes disappeared altogether &
suddenly again fell as hard as ever,
upon which I was positive that they were
no more than the Recti Musculi, suffer-
ing so many different Spasms; and
ordering small friction & Spirituous
Ointment

Ointment to be rubbed along thes Muscles with some Narcous Medy the Pat. had two Tumors soon resolved. —

These Spasms or Contractions of abdom Muscles I have often seen taken for disorders of the Viscera, and treated accordingly.

Aneurism

This is an operation that was brought greatly in repute in this place, so that after having been several times practised with success, it has been much more frequently practised all over Europe since. When it was first done in this Town we were perswaded that unless the Humeral Artery happened to be divided above, where the Ligature was made it was impossible to save the arm, and accordingly had all the dressings ready for Amputation, But this is a groundless fear, for tho' it is a

thing

thing we would never have suspected a priori, yet it is certain, where the Humeral Artery in the Operation is tied, the small branches going off from above the Ligature to Anastomose with the branches below the Ligature, & the blood comes to move with greater Velocity in these than before. That they were greatly enlarged, & carry the blood into the Radical and Carpal arteries & supply the whole Circulation of the Arm. — Of 18, or 19 Operations that I have seen, there has not one miscarried. In several of them the day after the Operation the Arm was Colourless, flaccid, cold and numbed, & scarcely could you in Six or Seven days distinguish the return of a Pulse yet in your the Pulse was as strong at the first as ever.

Median Artery wounded

I can't help giving you an Instance of the

the Absurdity of the ordinary practice of light Bandages in Case of an Hemorrhage.

A Gentleman (a Relation of my own) in fighting a Duel had a Sword run into the fore Arm and the Wound Bleeded freely. Two Surgeons were present, and they immediately laid a light Bandage over the wound, but the Blood ran violently, so that they were obliged to loose the Bandage and the Bleeding was greatly diminished, but still shewed a considerable Branch of an artery wounded, which it was impossible to see without enlarging the small wound, and they never thought of doing that, they applied a Bandage a 2.d time but with the same Success, so that they were obliged to introduce a hot Iron thro' a Canula into the wound, as the Gentleman told me since. By the size

of

of the hot Iron I am certain it would have no Effect in stopping the Hemorrhage, which however, by unloosing the Bandage, and after the Pat. was quite gone (as they thought) through loss of Blood gradually stopped. The Surgeons thought this something very Extraordinary, but if they had designed, they could not have taken so near a way of dispatching the Pat. (in case the Gentleman wh. have died, they wh. have been tried for their lives. By the strongly compressing the Ulnar & Radial Artery where must the blood flow? There is a necessity for it's being thrown thro' the Median with extraordinary impetuosity, so that in such a case the last branch of the Artery becomes a Trunk and will soon afford a violent Hemorrhage. This practice is ordinary after Amputations, & in the

Infirmary

In simmary I have pulasloplo Blooding
that had continued several days, by
only culling the Bandage, and only or-
dering the Stump to be lightly bound
with a Napkin — I fancy you have
observed the difference there is in the
distribution of the Vesels in the
Viscera and these of the muscular
parts — In the Liver, Spleen, Lungs,
Kidneys, Mesentery &c the common
disposition is an artery for each
Vein, and these accompanying each
other in their Courses — In the mus-
cular part there are commonly two
Veins for each large artery, some of the
Veins are disposed Externally so as
not to be Subjected to the Action of the
Muscles which the strong Coats of
artery & the greater force of their Blood,
are more filled to avoid. These Veins com-
municate with each other, Thus the

Internal

Internal with the External Jugulars, 183
the Vena Cephalica and Basilica
&c In the Viscera the Circulation
is more equable.

Blooding in the Arm.

In the ordinary disposition of the Blood
Vessels if the Artery dont divide very
high up, the Cephalic Vein is absolute-
ly safe, except very often from a Twig of
the Muscular Nerve being touched,
which is of no Consequence. The
Basilic is often attended with Twigs
of the Ulnar Nerve, which are hurt
in V. S. but with as little danger. But
you see how directly under this Vein
the Artery runs, so that in lean people
(if the Vein dont swell considerably)
in which case it can't be opened trans-
versely with safety I never would meddle
with this Vein, you can easily feel the
Artery covered with a dense Substance.

The

The Expansion of the Tendon, if unluckily you happen to touch the Aponeurosis in V.S. take only on Cauda and the Symptoms are of very little Consequence, don use the wonted practice of desiring the Pat. to keep his Arm upon the Stretch. This is ordered forsooth that the Tendon may not be allowed to Contract and the Joint turn rigid, that there is no hazard of that in stretching the Joint, the fibres are more distracted & raise Inflamm.ⁿ &c whereas if you half bend the Arm & suspend it in a Scarff and use some Emollient & Relaxing applications you evade all the ordinary bad Symptoms.

In blooding the Median we have commonly the Tendon directly under it, as it lies in such a direction, that by bloodg the Arm of the Pat. with one hand of the

same

same side, we push away the point
of the Lancel from the Tendon, so
can not hurt it: but in blooding the
Left-arm with the Right hand or
Vice Versa, we drive the Lancel to
wards the Tendon, Hence the necessity
of People accustoming themselves to
Blood with the Left hand. —
When a Stone is passing thro the Ure-
ters it is easy to see, as the Ureter
passes directly over the Psoas
Muscle & makes it Contract, hence
it will press the more upon the dis-
tended Ureter, and as the Pat. binds
his body to ease the pain & give
them ease, the ordinary Psoas
Muscle must necessarily be in-
vailed in the Situation or perhaps
be quite Compressed, hence pain
& Insensibility in the fore part
of the Thigh — If by this Stone
the

the Spermatick Vein be Compressed, the Testicle turns viz by this means by the same Irritation affecting the Cremaster, the Testicle is drawn up strongly towards the Abdomen, & sometimes it is squeezed so that the Excessive pain in it, entirely absorbs the pain of the Loins, and this Pathognomick Symptom of pain in the Loins readily proceeds from the Intercostals being joined by the Branches from the Lumbar Nerves. For a case of this kind Vide Med: Essays Art. V.

After Amputation of the Lower Extremities the Pat: feeling pain in his Toes, or at least thinking so, his feeling the same in the old Ulcer may be Accounted for, from the Nerve being irritated by the Inflamm^n. or Subsequent Pus, and the

and the mind being so long accustomed
to have the Sensation of pain from
the Ulcer, or to communicate by that
Nerve, cant distinguish this new
Sensation, and that being used to
have pain from the place most
naturally imagines it comes from
where the pain was before, so that I
have seen people lift up the Bed
Cloaths to see if they really had still
their legs.

Sciatic. or Hip Gout

It is a very common disease, and tho it
is more common in Gouty people
from the Tophacious matter that
is in their Blood & is apt to be deposited
upon the Coats of the Nerves, as well
as upon the joints & Ligaments, yet
it is very common in Pat.s who never
had the Gout. The disease may arise
from more different Causes, or is Sub-

ject

Subject to greater mistakes in practice than this. The common Symptoms are violent pain in the Hip, along the course of the Sciatic Nerve, but chiefly about the beginning, the limb burns weakly & wasts. These are evident Marks of the Nerve being affected. The Cause I shall take notice of occasioning this Disease is seldom attended to by Practitioners & never by Authors. It is an Inflammn. upon the Coats of the Nerves, wherever the Pat. has the signs of Inflammn. particularly a fever along with the pain, we are to insist this Cause, even tho' the disease be reckoned a chronic one, which by the by is the Reason why the Pat. is so badly treated. Blood plentifully and timeously, and in short use the same Method that are proper in all those Diseases, which the ancients put a determination it is to.

The

The 2d Cause of it is a sluggish matter lodged in or about the Coats of the Nerve, this is often the Consequence of a former Inflammation here which being neglected and mismanaged & neither resolving nor rightly Suppurating, leaves the remains behind it. —

This is the only Species described to us by Authors, Drastic Medicines are proper here in this Case, as Hydragogues, Diuretics, Vesicatories, Sinapisms, or whatever tend to invite this matter back into the Blood, or such things as by their Stimulus will help to attenuate it, such as swallowing Mustard Seed & Gum & Gum Plaisters which by their Stimulus strongly affect the Skin, & the Skin Conveys that irritation more Internally.

The 3d Cause I take to be that of Tumors, Schirrous or Inflammatory, and

and whether affecting the Nerves more immediately or by Compression, being only Seated under the Glutæi muscles.

If such a Tumor come to Suppurate, the Patient is perfectly lost, for before the Signs of Suppuration or Fluctuation can be discovered, or the matter felt so as we can venture to make an Incision thro' so fleshy a part, the matter has commonly made it's way thro the Musculus Pyriformis or part of the Quadrigemini into the Pelvis or at least the Suppuration having vitiated the Nerves and the Patient pulled up Contentedly with being Lame for life. If but doubtful signs of Suppuration appear by Fluctuation, the knife ought to be used early.

Physiology

or a Short View of the

Animal Oeconomy

Reduced into Twelve Heads

Introduction.

In the following Accounts of the Functions of the parts of the humane Body, and the Method in which they are performed it is not to be expected that it should be very particular, since it is only designed for an Introduction to those who have not attended the College of Theory, and for a Remembrance to them who have attended it. The Method is as near as possible to the learned Boerhaave, but as two men seldom agree in every particular there is something in this small treatise which differs from him, and this is no more liberty than will be given to every body to differ as much from this. For it is only demonstration of

facts

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facts, and solid reasoning upon any of them which Ought to be believed. as the food of different Animals has already been considered, we shall begin with its Method of entering the body.

1st of Mastication.

The first thing requisite in Mastication is the O: :pening of the mouth, the way in which this is brought about is not by the Diagastrick Muscles as is generally supposed pulling down the lower Jaw, but by the Genio-hyoideus and Mylo-hyoideus for the Os Hyoideus being kept fixt by the Sterno-hyoideus, hyothyroideus and the Sterno thyroideus, the Mylo and Genio-hyoideus will come to act upon the lower Jaw, and thereby it comes to be pulled downwards, now when there is a design to break off a part from a solid body, the body is thrust in be: :tween the Dentis Incisores, then the lower jaw being pulled upwards by the Zygomatick Muscles, and the rest which serves for this purpose, thus

Teeth

Teeth comes to act Act like so many wedges upon
the Obstacle to be Overcome which is the mutual at-
:traction of the Particles of the Body, and before the
Obstacle can be removed the force applied must be
greater than the Adhesion of its Particles. The So-
:lution of Continuity in this case is brought about
by the Mechanical power of the wedge, which is de-
:monstrated by Mr. Robert Stewart Professor of
Philosophy to bear the length of its side to the half
of its Base, and as it is granted that an angle made
by Concourse of two curve lines is more Acute than
any rectilineal Angle whatsoever. Now the Dentes
Incisores having curve sides must consequently
act upon Solid Bodies with greater force than any
rectilineal wedge whatever. Thus the part to be
Masticated is to be separated from the rest of the Mass.
The Incisive having thus performed their office,
the Morsel is broke by the Dentes Canini, then these
pieces are taken upon the tongue and thrown in
between the Dentes Molares, whereby the circular
motion performed by the Masseter External and

Internal

Internal Pterigoid Muscles it is ground to Powder
In Order to do this the Molares act with much
greater power than any of the rest, because they are
nearer to the Fulcrum or Center of motion of the
lower jaw, and it is for this reason that when
people have a mind to break a Nut or any such
hard body with their teeth they always throw it
between there Teeth, by this we come to see that the
principal use of the Teeth is to chew & Masticate the
Food, tho' they indeed serve for another great use,
especially the Incisores, Viz. the formation of Speech
for we see that those people who want them come
to Lisp (as it is called) and cannot pronounce such
words, as have the Letter L or S in them, and as the
Dentis Molares have the greatest share of the Mas-
tication Appointed them, so we see they are excellently
adapted for this Use by having their Base flat,
and their roots Split in two or three or more
fangs, whereby they stand more stable in their
Sockets, and Consequently are Able to bear the
Violent Circular Motion, which is performed by
the

the Moving of the Condyles of the lower Jaw in the Cavity of the Os temporum but as the Surface of the teeth is but small, the Bolus would be apt to fall off, if it were not keept on by the Muscles of the Cheeks, Lips and Tongue, Now it is not the Buccinator alone which prepares the Cheeks in Mastication, for when this Muscle Acts by itself it pulls the mouth to One side, but the Orbicularis Labiorum (which is the Antagonist to it) Acting at the same time keeps the two Angles of the mouth fast, so that this way, by the Acting of these two Muscles, with some small assistance from the Depressor Labij Superioris proprius, and Elevator Labij inferioris proprius, there comes to be a pressure upon all the Gums, whereby the Bolus is supported on the Outside, but there is none of the rest of the Muscles mentioned by Boerhaave, as the Zygo-Masticus elevator Labij Superioris &c which have any share in this Motion. — The tongue, which is entirely made of these Muscles, which are commonly said to be inserted into it and by which it can move itself every way, turns the food

between

between the two Molares, and turns it from one side to Another, in the Mean time, the Salivary Glands being strongly pressed by the Alternate motion of the Muscles pours out their Liquor in great plenty, at this time, which being mixed with the food makes a kind of Dough in the Mouth that it may be the more easily swallowed. Thus there is always the greatest Secretion of Saliva when their is most need of it — And this seems to be a proof that the Chin or lower Jaw is pulled down by the Mylo-hyoidei Muscles Viz. That the Sublingual & Maxillary Glands are placed so near these Muscles, there was no Necessity for any thing of a considerable quantity of Saliva, except in Mastication, hence the Gland Parotis is placed near the Masseter — That it might be pressed by it, when it moves from the Salivary Glands being all placed near the Muscles which move the Jaws, it would appear that there were No Saliva Secreted without motion of the Jaws tho' some affirm that it is secreted in Sleep, but the

the contrary will appear by observing either Young or old people while sound asleep, and you shall never see them swallow down any which certainly they would, if there was any secreted, since it cannot pass out of the mouth. Consider likewise the Effects of Sleeping with the mouth Open, and you shall find it is immedeatly after waking dry and rigid, The quantity of the Saliva is very different according to the use there is for it, but it will appear to be very considerable from the case of a Gentleman instanced in the 13th Article of the 2d Vol. of the Med. Essays, who had the Duct of the Gland Parotis wounded and came over the Musculus Buccinator. The Liquor itself comes next to be considered, which is of a thin watery nature full of terraceous particles it has little Salt in it, & what it hath not like Sea Salt, but rather Sal Armoniack, as to the Effect it hath in our Aliments. If you consider it Simply as Water, you see it must insinuate itself into the particles & loosen their Connexion, But then if you consider

8. consider it as a Sapon aceous Liquor which is Com-
: posed of Oil, Water & Salt you will find it very proper
for Uniting with the different particles of your food
& that as it dilutes our Aliments it likewise reduces
them to a Pulp, Lastly as it is an Animal fluid which
hath often passed the Circulation it is liable to putrifac-
: tion & thus it is capable of further dissolving Animal
Substances. From all which it is evident, that the
Saliva is an Instrument of digestion The Bolus being
thus Masticated & wet with Saliva this must down
into the Stomach & from that down the Oesophagus
into the Stomach, which is Deglutition & is described
by Borch: in such a pompous way as is not easily
to be understood ——

II. of Deglutition ——

In this Action, the first thing to be observed is, the
Amygdalæ & the other small Glands placed at the
root of the Tongue, Velum Pendulum Palati &
all which are designed to furnish Liquor for Lu-
: bricating the passages ——

The

The Bolus then is first taken upon the tip of the
Tongue, which is drawn forwards by the Genio-
Glossus, and upwards by the Hyo-Glossus, then it is
pressed to the roof of the mouth by these & the other
Muscles of the Tongue, and the pressure being continued
gradually backwards the Os hyoides and Larynx
are drawn upwards in a Convulsive manner, by
which the Ligaments of its roots are relaxed, the
Epiglottis is pressed down by the Bolus, the Glottis
itself is contracted by its own proper Muscles & thus
the Bolus is sent down into the Pharynx, the Uvula
all that time is said to fall downwards and cover the
small hole of the Glottis, which is uncovered by the
Epiglottis, and is said to be assisted in this Action by
the Azygos Morgania, but it is evident from y^e
situation of this Muscle that it can have no such
effect, & besides the food pressed back by the tongue
would easily overcome the Azygos — again if y^e
Uvula Covered a part of the Glottis, the Bolus must
certainly be divided into two Morsels, our drink
run into two different streams, and it would be

impossible

impossible for a large a Body as a Cherry to pass on one Side of the Uvula, neither is there any Necessity for the Velum Pendulum Palati being stretched on the Uvula acting, You'd be sensible of this Convulsive Motion in swallowing any thing, so that Boerh: is much mistaken in ascribing this use to the Uvula from a very false piece of Theory, Viz: That the Uvula can sustain the whole weight of the Atmosphere. The way he proves it is, that when we breathe by the Mouth Alone, the pressure is all on one side of the Uvula, which by the Action of the Muscles is able to sustain the whole weight of it. But this is a very great mistake, for in the mean time that the Atmosphere presses on its fore side, it having passage in at the Nose, presses much on its back side, and thereby the Uvula have nothing to sustain, but only its own weight, and the vast pressure of the Atmosphere may be felt at any time, by putting one's hand upon the Mouth of a Receiver when the air is near Exhausted, not all the force of the

muscles

Muscles of the Arm shall be able to receive it until it
more Air be sent in, hence we may see what added
culus thing it is to say that the smale Muscles of the
Uvula can resist a force which all the Muscles of
the Arm are not able to do, but since this is not the
use of the Azygos or Peristaphilinus internus, let
us now Enquire what is the use of it, we shall see
that it is a very great use in Deglutition, for by its
being contracted the Uvula comes to be stretched and
kept firm, so as to resist the pressure of the tongue
and the Aliments, which if the Uvula was not
kept tight, would press it upward & so make their
way out at the Nose — When the Bolus is thus
got into the Pharynx, which is dilated by the Mus-
cles which compose its Substance in order to thrust
the food down, the whole muscular coat of the Pha-
rynx is immediatly brought into a State of
Contraction and now is the most difficult & labo-
rious part of the Deglutition, for as there are four
passages viz. the Mouth, Nose, Larynx and
Oesophagus, and the food being under pressure could
be

12. be apt to fall into any of them, if that the passage were not closed up, all which is done in the following manner. The tongue and Larynx being pulled up by the Styloglossi & Stylohyoidei, so that there is no passage to the mouth left open, so it cannot return to the mouth. In the meantime that the tongue is lifted up, it presseth upon the Uvula which with this pressure, and the Action of the Peristaphilinus Externus closes up the passage to the Nose that the food cannot pass that way. So as the Epiglottis by its own Elasticity lies up as soon as the pressure of the food is removed the Glottis is hereby left open, but this is prevented by Contraction of the Muscules Arytenoideus: and as was said before, the Larynx being drawn upwards and the Velum Pendulum Palati hanging downward comes to cover over the Glottis, so that there is no passage left open, except the Oesophagus into the which the Bolus falls, and is there thrust down into the Stomach by the Peristaltic or Vermicular motion of the Gullet, and the passage is facilitated by the

Glands

Glands of the Gullet pouring out a mucous ally
way as the food passes, which is exactly given to
the Saliva. The motion of the Gullet is performed
by Circular fibres contracting behind the food & the
Longitudinal ones Relaxing before it. This Mo:
tion is called Vermicular, because the Oesophagus
Waites is and shortens itself in one place while
it swells in another place, like as Worms do in their
Progressive motion. This motion is from its upper
to its lower end in Deglutition, and from its lower
to its upper in Vomiting & thus the food is brought
into the Stomach, where Digestion is performed.

III Of Digestion.

The change which Aliments undergo during their
stay in the Stomache, has been matter of dispute
in all ages. Celsus who lived in the time of Caesar
Augustus, in the Preface to his works, gives a
history of all the different Opinions before his time
and there have been several added since his time
some of which we shall mention. First, some
are of Opinion, that it is performed by Grinding or

attrition

Athition, of this Opinion was the learned Reaum
to whom we are so much obliged for introducing
the Mechanical way of reasoning in Physic in
this part of the world, It being only used in
Italy before his time. The founder of this Opinion
is said to be Erasistratus — 2dly That it is done
by pulsation — 3dly That it is done by
heat. Of this Opinion was Hippocrates, [illegible] Thes
are others, who still maintain Galen's Opinion
of Faculties, not only of Digestion, but of
every thing for which they could not give a
reason, they said that it was done by a certain
faculty, but yet they never know what that
faculty was, or at least never gave any Account
So that the whole design of their reasoning seems
only to be for concealing their own ignorance,
Lastly Chemistry about the 13th Century came
be greatly in Vogue, for the Chemists made an Ela
boration of the human body, & digestion by them
was said to be performed by a certain Menstruum
made up of Acids & Alkalies. But this Theory
is false, for if there were a Liquor made up of such
a

a Composition in the Stomach it could not subsist 15.
without an Effervescence, whereby it would immediat-
ly be turned into a Salt, which can have no such
Effects, yet Dr. Clopton Havers in the Philosoph:
Transact. gives his Opinion that it was gener-
formed by such a Menstruum as Sl. Ether, Sperb:
Vol. Vitriol. & he introduces his Thesis by the following
Experiment. Take Spt. Sulph. (. (. Salis a Drop &
and a piece of Flesh, mix all together & expose
them to a gentle heat & of a tolerable while standing
the Flesh will be dissolved into a milky Chyle
the while this is neither Acid nor Alkaline. Now
yet how could such a Menstruum come there, or if it
were there, it is such a strong Caustic that it would
in a little time destroy the parts of the Stomach
'Tis true indeed that in most Fishes Digestion is
performed by a Menstruum, but this is not a Rule
that since it is so performed in Fishes it must be the
same way in human Bodies, for we find that in
proportion to the Difference of the Bodies, that the
Menstruum is less in quantity & has less Acrimony
in

16 in it in human Bodies, than in fishes, & conse-
:quently can have no such Effects, hence we are to
allow this Menstruum a part in digestion in pro-
:portion to its quantity and quality, but the truth
of the matter seems to be that these Chemical Gen-
:men, have never been at the pains to find out, whether
there was such a Menstruum in the human body
or not, only they finding that such a Menstruum
has that Effect upon the food, and from thence
easily concluded that there must be such a
Menstruum in the Stomachs of Human Creat-
:tures. ——— Whereas it is evident that the Juices
of our bodies, are Neither Acids nor Alkalies.
Hippocrates assimed as was mentioned before
that digestion was performed by heat, his proof
of it was that a digestion was better performed
in winter than in summer, which was owing
to the heat being contracted in the stomach in
the Winter time and more dispersed in the body
in the Summer, It was the different degrees of
heat, which made the Stomach more or less

capable

capable for performing this Office. But this
Supposition is false, for there is no more heat
in the Stomach, than in any other Internal
parts of the Body, which can be easily proved
by a Thermometer in ones mouth and in the
Stomach of living Animals and you'd see that
the Spirits will rise as high in the one as in the
other, so that it was a mistake in Hippocrates
to imagine that Digestion was performed by
heat only. But still it was a greater mistake
in Mr. Rapin who imagined it to be done in
the following manner. He made a strong Iron
Machine into which he put the matter to be di-
gested, as Ligaments, Bones, Cartilages, and
hard cob parts of Animals with a little water
& then Stopped up the Machine so close that
no air could get out, then setting it a gentle
heat for some time whereby the water was reduced
to a Jelly, from whence he concludes, that Di-
gestion was performed by such a heat, but
all the while he never Consider'd the vast

force

18. force of the Expanded air being rarified by the heat, and now as it could not get out, it would have broke the Machine into pieces if it had not been strong, so that it is the force of the rarified air which separates the matter, and not the force of the heat, and therefore Digestion cannot be performed this way, since our stomach is so far from being shut up, that there may be both an Ingress and Egress of Aire at both ends of it, by the Oesophagus and the Anus, & the strength of the stomach is not able to resist any great force, as is shown by Dr. Hales his Hydrostaticks, so that heat only so far as it helps to separate the parts of the food in some small degree can be allowed of in Digestion.

Then after the middle of the last Century when the Mathematical learning came into vogue, some again revived Cassibal's new doctrine accounting for it by Mechanical pressure among whom was D. Alcairn Jurisconsult & Physician who wrote a long dissertation, wherein he affirmed

assumed that digestion was performed by Trituration, which he demonstrates to be equal to the pressure of 117088 pounds av.dp which the absolute weight of the Diaphragm & abdom.l muscles being added Dr. Keil says (which certainly was to please Pitcairn) that the Sum will amount to 250734lbs which indeed is a very ridiculous thesis. ——

Where is the necessity of such a vast force as if the obstacle to be removed was next to invincible, beside this Much to be doubted that the Stomach could not bear the prodigious force, which Keil ascribes to the Diaphragm & abdom.l Muscles. but suppose it could resist it without being burst to pieces, how could such a vast force applied to a part that is well furnished with Nerves, as the Stomach is, without creating an intolerable pain and besides one should imagine that 1/4 lb. of the weight would be sufficient to pound the Victuals to a Jelly, since they cannot perswade men that it is made of Stone or metal. and if this Opinion was true there could never a Child come to the full

time

time for either the great pressure would hender it
motion, or destroy it after it was formed, & not
only the Fœtus but the whole Viscera would like-
wise be liable to be destroyed. But to return to
Pitcairne's Assertion. First it is not possible
that the Stomach of a human creature can exert
such a force, since it is rather a Membranous Vis-
cus than a Muscular one, at least in Comparis
with Carniverous Birds — Indeed if the Stomach
of Creatures had been like theirs, there had been n
need of his Assertion. 2dly He weighted the whol
Stomach, whereas it only ought to have been
Muscular coat besides the weight the Fœtus is
one half greater than the weight of any ordinary
Stomach. 3dly There can be but very little Peri-
stallic motion in the Stomach, for a proof of this
See Mem: Acad: del Scians where they made
Experiment of giving a Dog a Dose of Corros.
Merc: & when it had the greatest vicious to vom
he thrust his finger thro a hole made in the
Ligament

Ligaments to its Stomach where he found little
or no Contraction, only the Diaphragm was Convulsive, but not so much as to hurt his Finger.
The contrary to this Mr. Morison mentions a poor man
which had a large wound in the abdomen thro which
he could see the Peristaltic motion of the Stomach
like that of the Guts, and in short there have been a
vast many diff.t Opinions concerning this Action
of the Stomach according to the diff.t Philosophy
which was then prevailing and then prevailing,
and the fault of them all seems to be in ascribing
the Action to one particular, which were really
performed by Many.—

After having denied these Opinions we come
to give that which seems most probable. First
then we Suppose the Stomach to be a Vas Cauguem
exposed to a gentle heat, such as that of the body
having a gentle easy Contraction from the Muscular fibres and having its Contents perpetually
Conquassated by the Action of the Diaphragm
and Abdominal Muscles in Respiration & likewise

in

in some measure by the Pulsation of the Aorta on its back part, and that of the Coliack and Hepat: : ick Arteries while the air contained in the Alimentary Particles being rarified by the heat comes to separate the parts Gently and by its Elasticity creates a motion or tumbling of the parts contained. We find an Instance of this in y^e parts of the food which the air brings up with it in bleaching, and the drink which is taken to: : gether with the Saliva & liquor Gastricus Mace: : rate the food, by their insinuating themselves into all the Interstices of the Particles and this Ac: : tion is still further'd by the Natural tendency which all parts of the food have to Corruption and putrefaction, and thus by the Means of all these causes Digestion is performed, and not by any one cause alone. The food being thus Dis: : gested, the parts which are first in this State either by their lightness or by being reduced into Liquor passes out of the Stomach into the Duodenum by the Pylorus while that

that which has not its parts sufficiently divided, abides till it undergoes some further degree of digestion in the Stomach, and then passes out the same way into the Gutts, where is performed Chylification.

IV Of Chylification.

When once the Food is reduced to a fluid State in the Stomach, it is sometimes called Chyle, and therefore the Action of the Stomach might be called Chylification, whereby this & the former Class would be all one, & so needless to divide them; but they differ in the following points, and so must be treated Separately. Digestion only reduces the Food into a coarse Chyle, fit to enter the Intestines whence Chylification prepares it for Entering the Lacteal Vessels, and being mixed with the Mass of Blood.

The Food having undergone Digestion in the Stomach is thrust out of it by the Pylorus into the

Duodenum

24 Duod denum
This generally of a greyish Colour at this time
but in its passage thro' the first Gall bladder
: d with Bile and Pancreatic Juice which last
: mean a him to the Saliva, as appears by the
first Experim.t of opening a Dog alive, and
Slit open the Pancreatic Duct, & introduced
a pipe into it, and into other end into a bottle
where he got a sufficient quantity for exa-
: amining it, which he found exactly a
kin to the Saliva but the Bile is more alkali
and Saponaceous, the proportion of fibrous oily
and Saline parts being greater than the watery
parts. This Bile is of two sorts, the Cystic or
: what is contained in the Gall Bladder and
the Hepatic or what Comes from the Liver by
the Ductus Hepaticus, the last is a mild
Liquor easily mixes with the Chyle and dilu-
tes all its Oleaginous & Saline parts, this and the Pan-
: creatic Juice flows Constantly into the Duod-
: denum whereas the Cystic which is of a thicker
Consistence is more Viscous, Saline, yellow

and

and bitter, it is the most Alkaline liquor in the
Body and in some morbid cases it was a perfect
Alkaline. This liquor is only poured into the
Guts when the Gall Bladder is prest by the
Stomache being distended, and it is very necessary
that this Bile should not be always poured into
the Guts especially when they are empty, lest by
Stimulating them too much it should occasion
Bilous Cholicks, Cholera Morbus &c. It was
given gently to Stimulate the Intestines and to
keep up the Periodallic motion of the Guts &
under the Rarefication of the Air contained in
them. Hence when it is either wanting or
Inspid it Occasions a Tympanites by the
Guts not being Stimulated to Contraction,
while the Air in them is constantly inlarg-
ing their Cavity, besides in common with
the Hepatic it dilutes the Chyle blends it only
and watery parts together which makes it mix
more easily with the Blood, that the Chyle
may be still the more diluted, the Calcareous

of

of the mesenterick Arteries are constantly pouring out Liquor to the Gutts, while the Chyle is forc-
:ibly hurried forward by their Peristaltic motion.
This Peristaltic motion is by D. Martin in the
1st Vol. of the Med. Essays thought to depend upon
the Alternate pressure of the Nerves which the
Guts and other Abdom.l Viscera, for when the
Diaphragm is acting, the Guts are not perform-
:ing their Vermicular motion because the Spir.
are then denied a passage through the pressure
the Diaphragm makes upon the Nerves
in its Contraction. but when it is relaxed the
Guts are in their Peristaltic motion, the Chyle
then being a little put forward by the action
and a little Retarded by the Valvulæ Conniventes
its thinner parts are gradually received into the
Open Orifices of the Lacteals & Mesenterick Vas.
and then a dispute arises whether it is done by
Mechanical pressure or by the Attractive pow-
of the Capillary fibres called absorption. tho
it

it can be performed in any Capillary Tube 27.
is not yet determined by Philosophers. E.G.
Take a piece of Lump Sugar, and put one end in any
liquor the whole will be wet by Degrees, if there
be liquor enough, for if it was done by any Mecha-
nical pressure we could certainly imitate it yet
no force applied to the Intestines can make the
liquor flow into the Lacteals of a dead Body
which by losing their Rapidity and Energy
also lose their Absorptive quality, and Vege-
tables in their progress thro' the Guts lose their
Acidity and turn Alcalescent, & come nearer to
an Alkaline nature, when the Mesenteric
makes it go into the Lacteals, the Guts having no
proper Lymphatics, except the Lacteals them-
selves, but the Lacteals have a Lymph poured
into them near the Surface of the Guts from the
Mesenteric Artery, and the Chyle is still more
diluted by the Lymph in the Glandula and
Receptaculum Chyli, where all the Lymphatics
from the inferior Extremities and Abdomen

terminate

terminate & where the Chyle is more intimally blended. Then it mounts up the Ductus Thor: racicus assisted in its ascent by the Valves and the alternate pressure of the Diaphragm & pulse of the Aorta receiving in its passage Lymph from all the contained parts of the Thorax, before it terminates in the Subclavian Vein, which it does very slowly and in small proportion to the given quantity of the Blood, for Suppose the Chyle in the Thoracick Duct with a Velocity Equal to the Veins (which certainly does not) then the quantity of Chyle to that of Blood will be in the sinus Venosus as the Area of a transverse Section of the Thoracick Duct to the Sum of the Area of a transverse Section of the Veins of all the Body. Now the remaining parts of the Chyle which are to pass to enter the Lacteals is tumbling down the Gluts & a part of it taken up by the Mesenterick Veins distended the Intestines, and its thus that people may be nourished by Chyle & spirits thrown

up

up that way will make people drunk as if
taken at the mouth. Now then if there be no Lubeal
in the great Guts, and Glysters can get no further
than the Valvulae Tulpij, by the absorption the
sudden Effects of Cordials are very Considerable, be-
sides what is owing to the Stimulus made upon
the Nerves, as Cold water revives people when
fainting.

Now the grose parts of the food are still going
forwards & by the Acrimony stimulates the Glets
and helps its own propulsion. This is also assist-
ed by the Mucus that is poured out of the Glands on
the Coats of the Intestines, and particularly into
the great sacks of the Colon where it lyes in great
Quantitys, and it would be ready to grow hard &
uneasy if it did not get a great deal of Mucus.
Sometimes for want of the proper Mucus, Folks
are pained by the hardness of y^e Faeces, and from
this generally all pains of the Guts proceed,
& Glysters relieve them. From the Appendex
Vermiformis that reservoir of Mucus, called

by

by some Caecum tho improperly it at last gets down to the anus, and by the relaxation of the Sphincter ani assisted a little by the Levatories ani it is thrown out; The Diaphragm & abdom: muscles shareing in the action tho very little for we see when one is Cut off, and all these to assist this action, how little they can do. M^r Bomberg in the Acad: Science of Paris saws that upon giving Camphire & aqua Vitae by way of Clyster, they soon tasted in the mouth & intoxicated the person, and D^r Stubbs in London has also found it by Experiments——

V

Sanguification and the Circulation of the Blood——

The whole colour of the Chyle seems to be principaley owing to the Liquors that are mixed with it in the Duodenum, M^r Haugraave Injected a Liquor of a Blue Colour into the Guts below the Duodenum, and found that the Chyle entered the Lacteals still coloured.

The

The Chyle never enters the Lacteals in the same manner and form as the Aliments were, when first Elaborated in the mouth, unless those with great difficulty changed as Sea salts, & all the very strong Aromatick Spirits & which are found in the milk of Nurses without any Considerable change, the Chyle in its progress is more & more changed into an Animal Nature by the Animalized Liquors mixed with it, so that at its entrance into the blood it makes no Chymical Effervescence, but the Chyle immediately changed into the Nature of Blood tho it has undergone one Circulation yet it has still something of the nature of the Aliments, i.e. Digestables, for it inclines to acidity. The Chyle then coming out of the Thoracick Duct into y Subclavian Vein is carried by it into the vena Cava & into the right Auricle where it is blended by the Columnæ Carneæ in it, & whence the red Colour of the blood may be Accounted for from the pressure & force with which it drives its parts close together. For if this pressure be diminished & y

blood

32. Blood allowed to rest we find a ready Globuli
fall down into smaller ones, viz, Serum, then it
becomes of a pale yellowish Colour, at the same
time every single particle when thrown out
of the heart has a rotation round its own Axis
hence comes the Spherical figure of the Globules
of the blood. When the blood is thrown out of the
right Ventricle into the Pulmonary Artery, the
Branches of which are dispersed thro' the Lungs
it is still more Compacted by the Pressure of air
& so rendered Specifically heavier, the particles
which have a strong Cohesion, being more Com-
:pressed, & those that have a slight Cohesion &
Contraction are more dilated and for this reason
the left auricle is less than the right tho' the
same quantity of Blood is Contained in each
of them because that in the less is Specifi-
:ally heavier. I know some will allege
that the blood will be in danger of becoming
too hot by frequent Circulations & that the
Lungs serve as a refrigitory to it, the
Blood

Blood is driven with great impetuosity
thro' the Lungs, & if you apply a Thermometer
to the Right Ventricle, and to the Left you will find
the heat to be as great in the One as in the other
The Blood then coming from the several parts
of the Body, from the two Vena Cavæ into y^e right
Sinus Venosus and Auricle into the Left Ventricle
by the Pulmonary Vein, the branches of which run
along with the Artery, & are distributed thro' the
Lungs; from the Left Auricle it is thrown into y^e
Left Ventricle, from thence into the Aorta, & so by
it is distributed to all the parts of the body, &
returned by the Veins. As long as the Animal
lives, this Circulation is kept up; it is needless now
to insist upon the proof of the Scheme, since it is
universally allowed, but you are not to imagine
that these things happen in the same order, just
now said, for the two Auricles are Synchronous,
and the two Ventricles are Synchronous, which again
are Synchronous to one another.

D^r. Nicols in his Syllabus Anatomicis contradicts

this

this, but as he has advanced no proof of his opinion, it need not be regarded, because all: hypothesis contradicts it. — There is a question that is not solved by Physiologists Viz. Why the Pulsation is not the same in the Veins, as well as arteries, seeing the Alternate resistance made by the Contraction of the Auricles to the returning blood in the Veins, would have the same Effects, as the Alternate force applied to the blood by the Ventricle, when the blood flows into the Arteries. But I think this difficulty may be solved in the following manner. Viz. That upon observing the Pulsation of an Artery, we shall find the time of the Stole or Diastole (which almost to the Systole of the heart) is but half as long as the Systole, that is the Systole of the Arteries & the Auricles of the heart is as the time 2, & the Diastole as the time 1, so the Systole of the heart 1, its Diastole 2. again if we Examine the proposition of the right Auricle & ventricle we write find the Ventricle is said to contain three and the Auricle 1, now the blood in the Vena comeath to the right auricle with an equa

equal Stream, sending equal quantities at
equal times, when the heart is dilated, or in its
Diastole, the Auricles Contract, Viz. the time 2 & sends
its quantity to the Ventricle, which it cannot fill
to the Vein in this time 2 pound in the quantity 2 which
makes up the quantity required viz. the quantity
3, so the blood in the Veins is never stopt, so long as the
the proportions hold. But in morbed cases they do not
always hold, and so we find a pulse in the Veins. Mr.
Lomberg in the Mem. de l'academ de Suence observed this
in an Asthmatic person, I have observed it in the Jug.
gular Vein, abstracting from what the Curious Gentlemen
could do herein, & since the left Auricle & Ventricle
do bear the proportion as well as the right Pulmonary
Vein should have a Pulsation, but this cannot be
determined, for by that time you have laid bare a
branch of the Pulmonary Vein whether you saw a
Pulsation or not. you dont know but it was the con-
trary when the Animal was in health. I shall con-
sider when the blood is in the Ventricles & there are
Ventricular Sys. there is a small quantity pounded out

of

of the Coronary arteries into their Cavity from the Substance of the heart, this is done lest the Vessels should be in danger of Breaking by the Contraction of the Ventricles — When the Ventricles Contract, the blood is hindred from regurgitating into the Auricles of the right by the Valvula Triens pidis & upon the left by the Valvula Mitrialis, these Valves do not Clap close to the Substance of the Ventricle by reason of the Carneæ Columnæ & so the blood gets in between the Ventricles & the Valves, & stops the passage into the Auricles, & the Blood is hindered from getting back out of the arteries into the Ventricles by the Valvulæ Semi: lunares. It is not easy to determine whether the heart is shortned or Elongated by the Contraction of the Ventricle for at the very time of the Systole of the heart it's apex strikes against the Ribs Harvey had a good Opportunity of seeing the Contraction in a Young Gentleman who had a large Aperture in his side & some other ribs being broke off it burned callous less a large Opening where he saw the heart striking against the Ribs, & yet notwithstanding may be shortned in its Contraction for Supposing the heart to be so E. G. but the 30th of Jan

Anat

Inch then the heart must Really be shortned in
its Systole, while the Ventricles & Arteries are Sup-
posed to be two 10ths of an Inch. For if you put
water into the heart holding it in your hand & strike
on the Apex & the Valves will Rise as in Contraction
by which you'll imagaine that this shortning must
happen at the time of the Systole of the heart, and
by pressing the Sides of the heart close together the
same thing happens. By all the trials I could
make, I am apt to think that it shortned tho' not
considerably, & a priori one should think it ought
to be shortned, for the Tendinous fibres being at the
Base of the heart, the Apex should be drawn up to-
wards these. The Arteries in this Contraction have
never their Cavities entirely taken away, when
the blood is propelled from the two Ventricles, the
motion of these very instant is Communicated
to the Extremest parts of the body, tho' with a much
smaller Velocity, otherwise the pulse of the Arteries
at a different distance from the heart would be
at all different times from each other, for in the

Arteries

Arteries the Velocity of the blood continually decreases the further it goes from the heart, so as the Velocity of the blood in the aorta is to the Velocity in the small Branches so is the Area of a Transverse Section of the one to the other. And as the Area of the Transverse Section of the Aorta itself is to the Velocity in it so greater, but the Velocity in the Arteries constantly increasing from the branches to the Trunk because the blood is really running from a greater to a smaller Canal, The sum of the Areas of the Trunks of the Veins being less than that of the branches contrary to the common Opinion, and for the same reason the blood in the Arteries run in a Continual Stream so that the Arteries must be always full, tho' it is questioned, but if otherwise the Pulse could be successive as above. For if you cut an Artery the Blood you'll see will be performing different Parts. The Velocity of the Blood during the Systole of the Heart, is to its Velocity during the Systole of the Arteries, as the force of the Heart is to the force of the Arteries in the Systole & Diastole, tho' if you look at the Orifice you'll see it comes out at a continued Stream, there being no more in these Arteries

at

after their dilatation above what there are at there
Systole than what the left Ventricle of the heart can
throw out at a time which is not above ℥ ij. for
Suppose the heart could contain ℥ iij. yet betwixt
the Contractions the External Arteries are pouring
their blood into the Veins, at which they would be emptied
ed at least ℥ iv so that there remains only ℥ ij for
as long as the Animal lives the whole Vascular
System must be full, so that it is one mistake that
people allidge, that the Arteries are entirely emptied
at the time of their own Contraction. We know that
the blood is constantly from the extreme Branches
of the Arteries into the Veins, & we can imitate it by
Injections, but what it cannot get from the Veins
into the Arteries by our Injections I know not, but
it seems that Mechanism should assist in the
Bloods Circulation when it comes to the extreme
Arteries where the propelling force is taken
away.

The Use of the heart is Accounted for in a particu-
lar Treatise at the end of my Osteology. Harvey
generally believed that the heat of our bodies comes
from

from the Friction that the blood suffers in the sides of the Canals, and the Particles driven against one another in their motion, so that the heat of our bodies must be in proportion to the acrimony of the Blood, yet I do not know any Experiment whereby to find the action of the Solids and fluids on Each other in their motion. If you apply a Thermometer to Water that has fallen from a high Precipice upon a Rock & consequently have suffered a Violent Collision, or as in water mills, you find it as cold as any other water. Indeed in fermenting wines and Churning milk where there is a great heat produced, as in our bodies there is always a tendency to Putrifaction, which is a good measure produced by motion and attrition, & Putrifaction is attended with heat, hence the motion & attrition of our fluids and solids against each other is a cause of heat, Viz. in Violent motions as in running and hence the greatest heat is, where the greatest motion is, i.e. in the large Vessels, but Dr Martin says the heat was as great in the small as in the large Vessels, tho indeed it cannot be easily

demon-

readily known, whether the tendency to pulsation be the cause or Effect of their Swelling as may be Guessed to act mutually with one another, so that one cannot be said to cause the other, but they depend upon one another; as was above said the Arterys are never Empty but have always Blood in their Cavities, so that the Blood which is now in their Cavities makes but a small resistance to the new Blood which is thrown out of the Ventricles the Blood which is presently thrown out of the Ventricles gives an impulse to the Blood, which was before in the Arteries they being always full in the same manner, as E. g. Take any Tube, fill it with liquor close at, and youll find it will immediatly be communicated to the Liquor at the other end, or strike a row of Balls contiguous to one another, at the one end, and the motion will immediatly be communicated to them all, by this then we see that the very individual quantity of Blood that is thrown out of the heart in its Systole can reach all the Extreme Vessells at the very same minute of time, but only somewhat was consumed in

the

the Arteries arteries before being driven forewards by that immediatly succeeding which is thrown from the heart. The slower its motion is during the branches of the Arteries are considerably smaller than the Trunkes, so that in the small Capilliary Arteries the force of the heart seems to be intirely lost, & the blood is returned to the heart again by the Veins, which are the Lacteal Branches reflected back by being ill more absorbed by them and the force of the heart they being so small as only to hinder the blood to stagnate in the part.

VI Glandular Secretion.

The way how Glandular Secretion is performed seem not quite to be agreed upon, From the time of Malpighius to Ruysch, the Malpighian scheme of Secretion was generally agreed on and received. He defined a Gland to be a small sack composed of two Membranes upon the sides of which Vessels wind the Lacteal Branches of which he supposed the Secreted Liquor to be carried off by the Secretory Duct, the remainder part of the blood being brought back by a proper Vein; This Scheme was agreed upon by every body I say till Ruysch opposed it; for he would not allow a Secretion to be performed by an intermedeate Follicules, otherwise he does not differ much from

from Malpighius, only he would have the Excretory
Duct to be a Continuation of the small Lacteals,
but it does not seem probable that a large Excretory
can be performed this way. but whence comes also
Plexus of Vessels surrounding Malpighius's follicules
which I believe he'll be at a loss to account for.
All that can be said on either side of the question is
done in Boerhaave's Epistle to Ruysch, defending
the Malpighian scheme, and in Ruysch's answer to
it, where D.r Boerh: has plainly the better end of the
Argument so that Ruysch seems to come poorly off.
For had it been otherwise Mr. Ruysch since would
have been able to make it appear to the world that
he was in the right against Boerh: & we see Boerh:
delivers himself in a plain way the more easily to
accomodate himself to Mr. Ruysch's capacity, and
we see by his answer that he was not aware that
so much could be said on the other side of the question.

Malpighius's arguments are, That in morbid cases
as in obstructions of the Liver &c the follicular bags
are frequently seen by the naked Eye. To this Mr. Ruysch
answers that a long cylindrical Canal might
be

be found in the Pillicles by any Obstructions a-
:gain in several preparations the Bags might
be seen Also, as by boiling the brain, the cortical
part, which seemed to be composed of several
Spirula as in Inveterate Ulcerations of the Brain
in wounds of the Head, the Cysts are sometimes
seen. There are also two Cases related thereby
Mr. Lettice that seemed to favour Malpighius's
The one is of a Man in health being, accidentally
killed, in whose Liver he accidentally prosecuted se-
:veral of the Venae Portae to their Extremities in the
Follicula, a branch of the Vena Cava, arising from
the Pore, with a branch of the Porus Biliarius com-
from Each Bag. —— The other is of a Child who
had its Ureters strongly grown together, and he com-
plainly with the naked Eye see the Follicula and
Canaliculi coming out from them, & ending in the
Pupilla Urinae there. and another thing that would
seem to shew there is a Follicular, such as Malpi-
:hius contends for it, that a great many Secreted
Liquors change their Constitution and Consistence
as the Semen, Bile, Mucus Narium, and become
thicker in order to which there must be some
Reservoir where it is lodged, for the thinner parts
to be absorbed from it. —

Now

Now it is not easy to conceive how this should happen
even if the Glands were made in Ruyschs way.
Ruysch's Chief Answer to Malpighius is, that he
could never see such follicula in Corpore Sano and
that his Injection could never fill these pores. To
which Boerh: Answered that his Injections were not fine
enough, tho' it would Appear that Malpighius notion
for the most part took place, yet his followers have
carried it too far when they would not Allow any of the
Liquors of the human body to be separated without
the intervention of a Follicules, for it is plain that
what flys daily off from the Skin is not Secreted from
the Glandulæ Miliares, tho' in some parts of the Skin,
as in the Arm pits &c. There are indeed Glands, but
they Separate a Liquor very different from the Perspi-
ration. This Bag then is the most Simple kind
of Gland, when all the Vascelories unite & form a
large one, it is called Conglomorate. There is some
Oyl usually remaining. Qer. How many Liquors
are separated from one, pretty homogenious fluid
the Blood? The old notion was, that all the Vascelous
Vessels, had such & such Pores, so disposed as to admit

Such

46 such & such liquors of different figures, some
spherical, some angular Particles &c but since
our canals are of a Conical figure and also of a
Cylindrical, they will admit of all Particles
whose Length is less than their diameters. But
this at large is pulled by our Countryman Pit-
:cairn, in his Dissertation de Circulatione San-
:guinis per varia Minima.

The Chemists, observing a liquor so different from
the Blood to be secerned from it, would have it be
done by the Effervescency &c seeing that from
the mixture of some two bodies a tertium
quid is produced, but it is needless to have recourse
to such shifts as these, seeing that our Liquors
may undergo several Changes from the Mechanica-
:lone of the Circulation by which they may be
made in some places more Compact & dense and
in others more diluted &c. in some place to have
greater proportion of salts, in others of Oils by which
a Vast deal of Combinations may be produced.

Dr. Keil in his Chapter of the Glands gives an
Account of Glandular Secretions in that way
that is commonly received now a days, which is,
that the blood is driven to the secretory Organs in
some places by straight, in others by Crooked &

Serpentine

Serpentine Canals, in some at greater, in others
at less distance from the heart, & by Vessels of diff:
erent Diameters, according to the Liquor that is to be
Secreted. — In some morbid Cases, where the Secretory
Pores are preternaturally dilated, we find red Blood
Separated in the Testicles &c all the Vessels that are
Secretory must be straighter than those that admit
the red Globules, so that the least Particle of Blood
shall not pass thro' E. G. The finest & thinnest Li-
quor is to be separated, then the Canals are so wide
as to admit this Liquor, & none whose Diameter is
to be Secerned is larger, if a Liquor whose particles are
of the 2d or 3d. Size in their Diameters is to be Secer:
ned, then only those of the first Size should be in too
small quantity, these are some of the Lesser Vessels
going off from the Sides of the Excretories to take it
up and carry it to the blood again, thus the Semen
Bile & mucus Narium are very thin when sepa:
rated, as we may see by irritating the membrane
of the nose, for then there only comes away a fine
thin Lymph mixed of a thick mucus, after being
kept some time, so that to have the Liquor of a due
thickness

thickness you please it may be longer in the Gland, till it have the finer parts taken up by the smaller Veins, which are more in number according as the Liquor that is to be secerned is more or less thick

But there are considerable Objections against this way of reasoning about secretion Viz. Why does the Liver or Chyle Separate the same Liquor as that of a man, or that of a mouse as that of an Elephant, for should one think that a Child Sh. Separate Bile, then its Vessels being continually enlarged they should in some years transmit red Blood But the force of this objection is taken off if we consider that the Velocity of the blood is prodigiously diminished in the small Branches as may be seen in an artery of the bigness of a small Wheat straw it having no Contraction at all, so the blood runs in a constant uniform stream, and the Velocity of the Extreme branches of the mesentric Arteries is to the Trunk as 10 to 16. Then the Velocity is also demenished in the Extreme Branches by the Compression of the Neighbouring parts & by the attraction of those the Liquid should be to the sides of the canal so soon as that the heart does not propell the Liquor in the small

Small Capillary Tubes Viz. By absorption or any other 109
name you please to give it, only that the succeeding Liquors
are as it were an obstruction at large and determine
which way the Liquor should go. If this be the cause
that the heart and Arteries when contracted have no
Effect then the Vessels must always remain the same
way and manner Viz. Of the same Diameter in a child
as in a man or woman as also in the largest as well
as in the smallest Animals. — Some propose a different
way, they think less liable to objections. Viz. They
Suppose that at our first Creation there is implanted
a particular Liquor in every particular Gland, & after
that the Gland will receive no other Liquor, as we see
in dipping a piece of Spanish paper in Oil it becomes
incapable of receiving water & Vice Versa. This was
first advanced by Messrs. Lubner and Bernoil, and
improved upon by Winslow who Supposed the in-
ternal Coat or Tunica Villosa filled up its Cavity,
I mean the Capillary Artery, and this Duct as he
calls it is first saturated. — To this first I answer
only answer that there is no such Antipathy be-
tween any of our Liquors, that they have been
once mixed and will Easily mix again with
the least agitation. We come next to speak of
the particular Glands.

VII The

VII The Brain

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The Brain therefore gets its Blood in the most direct way from the heart, as the Orifices from the Carotid Arteries are directly opposite to the Left Ventricle of the heart, and so far as the Law in Hydrostaticks relates the finest and most solid parts of the Blood it will always get together, but it must be considered that our Canals are flexible & Elastick and so in the Systole they will bend the Blood & throw off the most Viscous and least moveable parts that is apt to stick on the Sides, and as the Internal and External Carotid divide at a small Angle, there must be a very small difference, and if the Law obtains, the first must go to the External Carotid without assuming any other. The Blood in Men has no far way to go, but in some Brutes that have long necks it has a very great way to go, but this is made up in them by the course it has downwards. The Internal Carotid makes no turn till it come near or within the Skull, it is necessary that the Blood shd lose some of its Velocity, considering the fine tender Canals it has to pass through—

The

The Eye is served by the Internal Carotid because the External has some Secretions of fine Liquor made from it in its passage, and so it comes to have more gross Blood in it & hence not so proper for the Eye. The finest and most Subtile Injections we can make, can never go further than the Cortical part of the Brain in a natural State there are no red Globules in the medullary part & when we Separate the Dura Mater, we see nothing but very small Vessels Excepting a Vein which runs a good way in the Brain but between its Circumvolutions.

The Cortex of the Brain seem only to be composed of Threads, for when it is dried it shrivels almost to nothing, in there are an infinite number of Vesicles or Bladders kept together in Clusters, in each of which enters an Artery and a Vein, and an Excretory Duct comes out, hence it Appears that it Serves for Separating a Liquor as other Glands do ——

The medullary parts of the Brain is always in Proportion to the Cortical & seems to be its Excretory conjoined. The medullary part of the Brain in Fishes is composed of Fibres lying Parallel to one another, the nerves then seem to Consist of the medullary part of the Brain Cerebellum and medulla Spinalis prolonged, and in all probability

probability they contain a Thread / yet it is denied by many, because it is never seen / but it must be very fine; for the Brain and Nerves have but very little Solid in them, as appears by drying them but there are some objections from a Thread not being able to perform those Functions ascribed to it. But as the motion here must be exceeding slow and small the parts of the Thread must have a slight Cohesion, otherwise it would be impossible but the force with which they run out, and the sides of the Canals will overcome the propelling force, which is here, as in the Capillary Tube, only the obstacle a tergo / as it is said Elsewhere / which hinders the regurgitation and determines the course of the Fluids, but to shew how great a force a small quantity of fluid will have take a piece of wood, and dry it well at the fire, then expose it to the air in a foggy day, and lay as much weight on it as you please, and in a short time it will raise itself, or take a piece of whip Cord, after drying it very well as before, laying pretty good weight on it, it will raise itself consider: : ably, provided it be so heavy as to break the Cord.

The

The Story of Pope Sextus 5th raising a large Pyramid
partly by wetting the ropes in water is very Famous,
Thus the force which the Liquidum Nervosum exerts
is very great on the Belly of the muscles, For we
Suppose the Nervous fluid to be such a Liquid Body
as common water, with a smaller proportion
of the other principles in it which renders it a little
Saponaceous, which from what has been said
above, is capable of penetrating the closest Sub-
stances, even Gold itself as was found by making
a Globe of Gold, then filling it with water, and
cementing and Soldering it together then pulling
it to a press, and Squeezing it the water was
found to penetrate thro' the substance of the
Gold. — The water then being compressed in
such a firm body, is capable of such a penetration
So that we may Suppose the Liquidum Nervo-
sum, such a fluid composed of such hard Particles
and firm, But in the mean time having a great
many Pores. Dr. Morgan pretends that if there
were of Thread it would be Subject to our Senses
But Dr. Booth answers him. If he would say
a Fly had no Juices because they are not demon-
strable.

Dr.

54 Dr Porterfield demonstrates in the med: Ex: that the Nervous fibres in the adina of our Eye must be an incredable number of times Less then a hair, otherwise we could not see objects that we do, how fine then must the Liquor contained within them be! The Nerves cannot act then by their Elasticity as some would have it, for by an Experiment of Dr Stewarts &c we found that they have less Elasticity then any of the Vessels of the whole body, which was by tying the Crural Artery Vein & Nerve, and Cutting them, the Artery and the Vein contracted themselves, but the nerve did not contract itself. But besides this way is attended with a great number of objections, that its favourers cannot deny, but that it ought to be rejected. E. G. That is the reason that after a Nerve has been tied, stroked down with ones hand one, or twice, the muscle that it serves should contract no longer, unless the Ligature be removed further up, or entirely taken away which makes it seem plain that the nervous Juice is stopt in its Course, and by striping it

it is sent to the muscle, and so it contracts still repeating the same till it is exhausted.

I suppose it to be the Elasticity which their flexible Coat & Situation seem much to confirm: did then suppose that pinching a nerve shd hinder its harmonic motion; yet it seems odd that I cannot just imitate the motion by shutting it down but granting this that I could do it by guess at first and for three or four times thereafter, why then cannot I do it for 20 times? This Experiment is related at the end of my Osteology Edit: 3d: as it was done by Pitcairn and myself, besides all nerves are deprived of their Coats before they are capable to give sensations, which if they acted by their Elastic motion would confound & hinder it. —

The fluid in the nerves cannot be alkaline nor acid for then they would destroy their Canals, and they cannot act by Explosion, for their must be some Liquor mixed with it at particular places, to set it on fire if I may so speak, for otherwise it would be continually in its own Canals, and it is certain that such an Explosion would be out of the reach of our commands. The nerves then being Canals full of Liquors, when any object is applied this

Liquor

by Liquor is hindered flowing so equally as before &
the resistance found at their Origin, and as Action
is equal to Reaction, so it will have the same Effect
as if it had been made there, seeing that all objects
act in our Bodies by plain Mechanical pressure
or impulse. The Brain then serves for Separating
the Nervous Fluid from the blood in the same manner
as the other Glands do, and this Secretion is Exceeding
slow. From what has been said, we see that all the
parts of the Brain serve for the same use and that
the protuberances proceed from the fibres being more
collected in one place than another. E. G. The Tuber
Annulare is nothing else but a Lump formed by
the conjunction of the Cura medulla oblongata
and the processus Medullos. Cerebelli. The Cavities in the
Cerebrum allow it to receive a greater quantity of Li-
:quor at one time than another without any harm,
hence the Nerves that come from the Brain serve
only to furnish a small quantity of Spirits at
some times, whereas the Cerebellum sends the Nerves
that serve the Vital Functions in a Constant
Stream. As the three Gentlemen will have the
Nerves to act by their Vibrating quality, and
will

will allow no other Use to the Brain than Separating a fluid to keep the Nervous Cord moist and in a constant capacity of acting, but then this Liquor would be subjected to our Senses which the Liquid nervoix is not. This is attended with insuperable difficulties, and indeed is rejected by the most part of the Physiologists, and yet some have gone so far as to assert that the Brain is not altogether necessary for Life, because of some Instances of Children and brutes being entirely without it, or whose Organs were pulhyfied or in the form of a hard lump of Flesh. But to this may be Answered, that these Animals never lived above a day or two after birth, and that they who had a Lump had Secretion performed another way, which supplied the Nerves with a fluid, and as too great a fulness of the Vessels whereby the nervous fibres are oppressed may occasion Sleep, seeing that Sleep may be called the time of recruiting the body worn out by the days Exercise; but then how comes it to pass that the Vital Functions are still acting in time of Sleep? This may be answered, that the Anterior part of the Brain itself has large Cavities or Ventricles which may be filled with the nervous

Juice

Juice, and so there may be some Slow of it laid up for the dayes wasting & consequently the flux of y Juice must be none or very inconsiderable, dureing the time of the Sleep, and as the greatest part of the nerves designed for the motion of the muscles come not from the Brain itself, and since there is no flux of Liquids, there can be no action of these muscles, but seeing there are no Cavities in the Cerebellum, and the nerves that come out of it serve the vital functions. so assoon as the Spirits are separated, they must be carried to the parts, hence it is that these do not act during the Sleep, & as muscular motion ceases during Sleep, so do all the Animal Functions become less. E. G. There is no Saliva, as is evident, separated when people Sleep when they have Slept with their mouth open they will find them dry and parched, but assoon as y Jaws are a little in motion the secretion begins to increase and so will all the others, except that of insensible Perspiration, which is an independent action of the Nerves as we exactly known by observation.

Having thus spoken of the secretion performed by the Brain, we come next to account for the use

of

of the Organs, which serve, tho' not immediately the Hypogastrick Viscera — First —

VIII. The Omentum or Caul —

This Membrane lys upon and covers the upper part of the Cavity of the Abdomen, so cannot come further down in the human subject than the Navel, tho' it comes further in Brutes. Its principal use seems to be to leave a thin oily Juice squeezed out of the Glands by the action of the Abdom.l muscles to lubricate and grease the Guts and keep them in a condition to perform their peristaltic motion. This is seen evidently by the smooth face of the Guts, being as it were oily after death, & it needs not come further down than the Navel, because of an Erect posture, and the readiness with which this oily matter here by this means to fall down to the Pubis, as it does in Brutes. In the next place we should be constantly labouring with a Hernia in the Scrotum —

The Caul seems to be subservient to the Liver for there is no passage to carry the Oil out of the body but it is constantly taken up by the Absorb.t Mesenteric veins, and so gradually mixed with the blood to be thrown into the Vena portarum and assists considerably in making up that Saponaceous & oleaginous Liquor

Liquor, the Bile, but it is not carried to the Vena Portarum in that direct manner, nor in so great quantities as Malpighius would have it, by the Duct. adipos. for there are no such Ducts to be seen. If it was carried in such a direct manner it would very difficultly mix with the blood in the Liver seeing it is of such an Oily nature, but it is taken up by and mixed with it in Small Quantities, and so insensibly blended with it before it arrives at the Liver. Which we shall next discourse of.

IX. The Liver & Spleen

The Liver Separates one of the Sharpest Liquors of the Body, and the blood which goes for its Secretion being the onely Blood in the whole body, that undergoes a Compleat Circulation before it comes to the Secretory organs for it goes to the Ven: Portar: after it has Served all the Viscera of the Abdomen. It has been matter of considerable dispute in all ages what change the blood undergoes in the Spleen, it is now generally agreed upon, that the Spleen is Subservient to the Liver. When the four Galenical humours prevailed, the Spleen was said to be the Seat of one of them Viz The Atrabilis; The Chemists again would have it to send a fomenting Liquor to precipitate the Bile from

from the Blood, & cause the Secretion to be more easy, but such ferments are not in the Body, if they were they would burst the tender parts of the Spleen. Sir Richd Blackmore maintains that it serves for Generation, for says he all the parts of the body, serves either for the Propagation of the Species or the preservation of the Individual. But it is easy to see that this Sylogism is lame in the Minor proposition; if it does not follow because he knew no use. If the Spleen served in the Individual, what induced him to believe it was of no use to the Individual, was that an Animal can live without it when dissected. but what makes against him is, that the Animal turns more Salacious a greater quantity of Blood being sent out by the Spermatick Arteries, & consequently more Seed secreted. They are more Voracious a greater quantity of Blood being sent to the Stomach, & consequently the Liquor Gastricus formed. but as those who carried the Experiment far Enough as M. Boyer have found that the Animal was some little time in health, but if it was kept any considerable time its Liver was found bitter & harder, with its Biliary Ducts obstructed, till at last it Died. — All agree that the Spleen is subservient to the Liver, tho they differ how it is so. — Mr Clopton Havers assigned an use to the Spleen, which is very ridiculous, telling us

that

62. that it separated a Muscilage which was carried by proper Canals from the Spleen itself to the Joints Mr. Cowper alledges that it serves to accelerate the motion of the blood in the Ven: Port: But a small artery from the aorta would have answered as well: besides all imaginable care has been taken to diminish the Celerity of the Blood. For the Artery divide into very small Branches which are spread in the Vessels of the Spleen where it is almost entirely lost of the laws of Circulation. Spoleti who was one of the first Mechanical Philosophers as also Belini or D. Keil, who seems to have taken most from him agree that the use of the Spleen is to retard the motion of the Blood, but they differ as to the manner of it, for Spoleti says, by a great Velocity of the Blood it is more Compacted, &c Contrary D. Keil will have it retarded that its parts may attract one another more strongly, so that the Villous Particles, which do not easily unite may have time to conjoin. He supports his notion too by observing, that when the blood is Stagnated, Or Extravasated it goes into Grumous Lumps.—

To me Boerhaave's Opinion seems most reasonable that the Spleen being exposed to the

alternate

Alternate Action of the Diaphragm & Abdom.l Muscles
the Blood in it Suffers some Changes, even in the
Lungs, and by their Concussion, the Blood will be
rendered thinner and finer, its Oil more rancid and its
Salts more Volatile, in short all its principles more
Exalted, and Since the Blood that is sent to the Stem Port.
from the Chylopoetic Organs has been Spoliated of
its Lymph and finer parts, so as to be too thick &
gross for the Secretion of the Bile, but being mixed
with the Blood from the Spleen, which consists of Acrid
and Exalted particles is rendered more Secretive, of so
Acrid a Liquor as the Bile is, The Spleen has no great
motion to perform, and has no quickness of Feeling, yet
being pressed with Hipocrie Disorders without any
great pain. The Urethra of so many Nerves distributed
tho' its Substance is perhaps to pour out a larger
quantity of Liquors than ordinary for Attenuating
its blood This seems to have some confirmation not
only from its Situation in Man, but in Brutes; As
Quadrupedes have it fixed to the Diaphragm, or
to the place where the Abdom.l muscles which have
the greatest Action, which is a little below the
Diaphragm. all Fowls have it placed by the side
of the Air Bags, so as to have it compressed by the

Contained

6th. Contained Air. All fishes have it placed upon their Swimming Bags — Thus we see that all these Creatures as well as many have it much subjected to Alternate pressure, which was a great Confirmation in the debate. The Ven: Portar: besides the Blood for the Spleen gets also the returning Blood from the Stomach, Guts, Mesentery & Omentum, which last as was said before gives a deal of Oil, and if this was not taken up by the Absorb: Veins would turn rancid & being near the Abdom: muscles wd destroy the parts. This Blood then from the parts above being mixed with that in the Ven: Portar. makes one of the fittest Liquors for separating the Bile which is done much in the same manner as in other Glands.

The next question is, whence comes the Bile that is in the Vesica Fellis, and whether it regurgitates back from the Ductus Communis? or does it come to the Gall Bladder by the Porij Biliarij or Sub: stance of the Liver by the Ductus Hepatic. Cystic. or is separated by the Glands on the Coats of the Vesica? Truly I think it comes by regurgitation. The Plug in the Duct. Cystic hinders a solid body such as a probe from passing either up or down, but

but they dont hinder a Liquid from passing either way. I dont see how the Bile may not regurgitate into the Vesicae, I fancy Compression is made on the Duct. Communic: in the Duodenum — as for the Duct. Hepatic and Cystic, Morgagni is absolutly against them. Mr. Winslow says, he only saw it in an Ox. But Mr. Perhault bestows a particular treatise on them. M. Bellini in the Leipsick Transactions anno 1680, and 83, and Branchi in historia Hepatica and Dut Verney in the mem: Acad. de Science, describe them, but howeu ill Comes, there is a great change made here of ill, for besides the absorption which happens to all Liquors in Cavities, it undergoes a Considerable change by the heat of the place, for it becomes more acrid & bitter — There are perhaps Glands in the Coats of the Gall Bladder, which Separate a Liquor much like that of the membranes of the meatus auditorius Externus, which by a little dilution with the water becomes a Liquor exactly like the Bile In Fishes the Gall Bladder is not Contiguous to the Liver else the Bile would have a very dangerous Course in the Duct Commun. so that it cannot be sent thither by the Canals which can scarcely be seen The Gall-Bladder so placed so as to be squeezed when the Stomach is full, so that

the

 the greater Quantity is Squeezed out when most needed. The use of the Bile was shown in Digestion & Chylification.

The Kidneys.

The Section of the Kidneys is made after the common way, only we must observe, that the urine undergoes a considerable change after it is seperated before it is thrown out, for it is not near so acrid high coloured, and of such a strong smell at first, by the thinner parts being absorbed both in its passage thro' the Ureters and during its stay in the Bladder Consequently its Oleaginous, Saline & Earthy Particles will manifest themselves better, and the heat will make it more rancid. A proof of this I saw in a Gentleman who had an Abscess in his Kidneys, which I ventured to open, upon finding a Fluctuation of humour and at every discharge the Urine came out streaked with the Pus, which I compared with some I caused him to evacuate from the bladder, & found them to differ greatly for that in the Bladder Consisted of more saline Terrestrious & Oleaginous Particles, for the water being Evacuated the Urine is more Exalted and high

high coloured by the Violent motion of the Blood & heat, Morgagni assures that it does not come from the Kidneys, but the greatest part directly from the Stomach to the Bladder for, says he the Mineral Water passes more by Urine after it is drunk than it is possible it can, if it went thro' the Kidneys Lacteals &c But certainly this Experiment has not been Accurately made, for he have been induced to believe this by observing that after two or three Draughts they made Urine, which he imagained was owing to the Draught taken immediately before, but he Sh. have caused them Empty their Bladders after the Draught, and then observed how long the second took to passe, which wo. certainly be considerable though not so much as possibly imagained, seeing the Motion of most of our Fluids is very rapid.

There is a Treatise published by the Professor of Lorain calculating the Circulation of the Blood & Secretion of Urine — Morgagni in his Philosophical Principles of medicine says the same & to prove it, he tells us, that he hung up the whole Viscera of a new killed Animal & poured water into the Stomach which he found in the Bladder in a very short time But this is also false. Being sensible it would be

denied

66 denied, he dropped it in the 2d Edit. of his Book
I made the same Experim.t my self, laughing at
at the same time being positive no Liquor would
pass, which I found it did not — again he tells us
that he tied up the Ureters of a Dog, and swelled up the
abdomen, yet found Urine in the Bladder in a short
time. This is said to be done by a Gentleman in
the Philos: Transact. who I suppose never Opened an
Animal for any other Experiment, This is false as above
There may indeed be some Liquor in the Bladder,
which is only the Mucilage of the Glands for
defending it & Coats against the Acrimony of the
Urine. These Gentlemen tell us, that neither the
Ureters above the Ligature nor the Kidneys were
Swelled at all — I have seen a total Suppression of
Urine from Stones in both Ureters & yet the
Patient Evacuated a small quantity of Liquor
from the Bladder, which was little whether than
the Common Urine, having nothing of the taste
or Smell, or any of the properties of Urine, yet
upon Opening above the Stones, the Ureters would
allow two or three fingers to be thrust into a fine
the Pelvis admit a small hand to be turned in
it, and the Kidneys themselves were three or
four

four times their Natural Size — Eustachius, who was concerned on neither side, absolutly believes that the Ligature must cause a Swelling betwixt it and the Kidneys, but the Ureter will collapse between it & the Bladder — Aselas & Morgagni fall on another way to account for it, finding that D^r Boerhaave in his Aphorism De morb. Gall. Affirms that all the human Body is connected by a Cellular Substance, whose Cells communicate with one another, he thought that this might serve this purpose very well, for the water might get into the Stomach, by its Cellular Substance which communicates all the way till it comes to the Bladder, but how it gets in the first place into the Cellular Substance of the Stomach is hard to conceive, for the Tunica Villosa is in its way, and then the strong muscular Coat of the Stomach compresses the Cellular Coat and makes it collapse, and so hinders any thing from passing through it. — Sometimes indeed when the Secretion of Urine is stopt its Evacuation is made another way, there is an Instance in the Philos. Transact. of a boy, who never passed any Urine, but had a Continual Diarrhoea by which he lived. But I wish this History had been more Accurately made, and that it had been shown whether the Kidneys sent the Secreted Liquor by particular Canals to the Intestines from the Glands there about.

Some under a Suppression of Urine have vomited up

up Something like it. — But a Suppression of Urine being continued, nature sometimes finds new Passages thro' Vessels entering the Bladder, & we are told it has been vomited up; But the Authors might be more Credited had they said that this Liquor tasted or smelled like Urine & that upon digesting it with Quicklime a fine Aromatick Spirit was produced, or the like, but they did not think this proper. Now since all Animals whose parts are too minute for an Investigation, all Quadrupeds, Fowls, Fishes &c. are formed with Secretory Organs, when they are anyway closed, Nature makes strong Efforts towards an Evacuation some other way, and since from a Suppression of this such bad Symptoms are brought on it would seem necessary to have a Secretion of this Liquor, for the health of the animal. To confirm this, let us consider the nature of Urine.

1st Then it contains a great proportion of water which of Necessity is taken into our Stomachs to assist in the dissolution of the most solid parts of our food, and prepare it the better for entering the Lacteals for our Nourishment, and to be converted into Blood, which after this seems to be of no further use, but prejudicial if retained, as we see upon Suppression of Urine in Leucophlegmatick Habits of Body Dropsies ensue.

2dly We know the Urine abounds with Salts and Sulphur

Sulphur & that it is Saponaceous from the great use it is
made of it in washing of Clothes &c
That the Use of the Saponaceous particles is, wash,
when talking of the Bile Viz. To mix & incorporate
the different parts of our food, to dissolve Coagulums,
as milk is Coagulated by an Ens Acid Liquor in the
Stomach of Calves &c which is never found after pass:
:ing the Entrance of the Biliary Ducts into the Intestines
when the Bile comes to be mixed with it, after this it
seems to be Useless & needs to be changed for a new
We know that by the heat the Salts are exposed to, they
become more Exalted & the Sulphur rancid, and by
becoming too Acid they will Vellicate the parts,
as we see in Hysteric Paroxysms, pale Urine and
attending Symptoms which denote the Retention of
these Acid particles to which the high Colour of the urine
is owing, and from the Retention of Urine in this Dis:
:ease proceed Cramps &c If the Paroxysms is some
cause of the pale Urine & must heighten the Disease
or the retention must have some share in promoting
the Paroxysms. In fevers, Clear urine is the fore:
:runner of Convulsions & from hence it seems neces:
:sary those Salts and Sulphur should be Evacuated
this way, since a sufficient quantity is not Eva:
:cuated by the Skin.

3dly The Earthy Particles is, as it were the Substraction
of

of Basis by which the Other are, as it were, detained & so must be Investigated in the Stalls, and of Neccessity thrown out with them, as we find in the Urine in Some purposes

Whilst A great quantity of Air must be taken in with our Food, and intangled in its Particles, Mr. Pelil gives instances of the bad Effects of great Evacuations, as the Vessels lose their Tone, the Compression of the Blood taken off, and the Air suffered to Expand itself and its Particles acting one on another, Swell and dilate the Vessels greatly to the great misery of the Pat.

That Air then seems neccessary to be evacuated & tho' we cannot easily shew it in Urine yet it must be there as when comes the Calculus to contain so great a quantity of it, as Dr. Heuer proves it does, from thence it seems neccessary that all the Particles of Urine should be Evacuated. Now the Blood in the Emulgent Veins returning from the Kidneys being deprived of its thinner parts by the Separation of Urine needs no attenuating to be rendered fluid to Circulate thro' the body the better, as the Blood from the Chylopoetic Viscera do, when going to the Lungs.

The Urine is promoted the same way that the Faeces are by a gradual relaxation of the Sphincter Vesicae & action of the Muscular Peritoneum. Urina & by determining the force of the Abdom.l muscles & Diaphragm to the Bladder

XI Muscular Motion.

This is a Subject which has given as much play to Luxuriant Fancies as any in Physiology and indeed is as difficult as any. — A muscle is a bundle of fleshy fibres connected closely by other muscular fibrilla. The tendinous Extremities consist of the same fibrils, only more closely compacted, and they are also more Elastic, but cannot contract. — The Arteries that are sent into them are divided into small branches, and it is owing to the blood in the small Arteries & veins that the muscles are rendered but the blood is not absolutely necessary for the Action of the Muscles as we see in some Fishes whose Muscles are entirely white, notwithstanding which they act. Lewenhoek in the Philos: Transact. 1722. demonstrates that a Globule of Blood must be divided into 6 before it can enter the Ramifications of an Artery towards the Contraction of a Muscle, what we think with our naked Eye to be a fibre, with the help of a Microscope will appear to be a great many fibres, & these single fibres tho' a better Glass will appear again to be composed of a great many more, and so we do not know how Minute the division of a fibre may be. When we Examine a Muscle very Accurately, we would think its substance to be made up altogether of Nerves the fibres being connected together by Cellular Membranes, in which

there

there is a little Oil joined by little transverse fibres which have a Contraction independent of the will of the Creature, as it entirely depends on their Elasticity, otherwise it would take place in a dead as well as in a living Substance, which it does not. — The Natural contraction is greater than the Elastick, and the Voluntary again far greater than the Natural, when the Arteries that go to any muscle are tied, then the muscle loses its Contraction unless it have some where else, which seems to have been Mr Browns Mistake who affirms that he tied the Carotid Arteries & notwithstanding the Muscles of the head still continued their Action and hence concludes that the Arteries are not Necessary for Muscular Motion. Might he forgot to tie the Vertebral Arteries, which also serve those Muscles. He was guilty also of the same mistake about the Crural Arteries. The tying of a Vein also hinders the Contraction of a muscle, for in this case it turns wider and thicker, whereas in the other case it turns pale and thin. If the nerve be cut or tied, the muscle also loses its motion. Mr Du Verney tied the 8th pair of Nerves in a Dog, and the heart in some measure retained its motion, because it was still supplied by the Intercostals. Some affirm that a muscle is always shorter when it acts, but I deny it, for when we bend our bodies forward the Trunk is supported by the Muscles of the back, hence it is plain that these

these Muscles are longer than when they do not act at all, In the same manner will we support any w^t in our hand, when our Arm is stretched. This is done by the Contraction of the Biceps and Relaxor Cubiti, which are then longer than when in a Paralytic state. motion can be communicated to any muscle instantaneously. There are no Experiments to shew that a muscle is inerca: ed in Bulk when it acts. If a person immerses his arm in a Vessel of water and then Contracts all the muscles of it, he will not find the water to rise at all, but perhaps the Experiment has not been made with care enough. Some allege Tedeencaves & Perhaps it may be so, for sometimes Vessels of the Skin labefy in very fat & for sometimes in bathing ourselves in warm water we send so much of it mixed with the Blood as to thin it and give the Urine a Watery Consistence. When a muscle acts it becomes softer, ladder, and while considering the small: ness of the Muscular fibres, & the firmness of the Liquor contained in them, we shd not ascribe any properties to them, but that which are founded on Reason —

p^t Some have affirmed that this Action of the muscles proceeds from a mixture of Acid and Alkaline Liquors Viz. the Blood & Spirits, but this Opinion need not be insisted upon at present to Confute it. Such parts are not to be found in the Body in a Natural State.

2^dly others again would have it performed by some Explosive power, Expanding air, or some such thing

thing.—But when this action could not be at our command. Dr. Sheil & Borelli have fallen on this method of Accounting for it, both on one footing, tho' they differ about the method of it; They both suppose that every Globule of Blood contains a small portion of air in it, which is hindered from Expanding by the Shell of the Blood—Borelli Supposes this by the Influx of the Nervous Juice into the muscles the Spiritus in the Animal Spirits to break the Shell of the Blood, and so the air being freed, extends itself and Contracts the muscle, But Sheil Supposes the Particles of the Animal Spirits attract those of the Blood more strongly than the Particles of the Blood attract one another, and thus the air gets free &c. but without discussing these Gentlemen to prove their Suppositions, How does the action of a muscle cause so instantaneously? Perhaps it will be answered that new Liquors are sent in. But how can the Expanding air get out, or new Liquors get in, when the muscle is in action? Daniel Bernoulli of Petersburgh supposed that the Nerves are twisted in a Spiral manner round the Villi of the muscles, which are nothing but the continuation of the small Arteries, So that when the Nerve is filled with Spirits, they collapse, and hinder the Liquor to pass, and inflate as it were the Cylindrical Villi, so that it

it is made more capacious in its transverse Diameter, whilst it shortens in the same manner as a piece of Gut distended with Air has its Diameter increased transvers by by having Threads laid here and there — Nerves says Theodorus aid by their natural Elasticity and Contractor, but this Ligature is by no means strong enough for the resistance and moreover if the same Fluid be remaining in the Muscles, how comes it to pass that in its Action it becomes of a White Colour?

4th Democrates has an Opinion much like this he imagaines the Muscular Villi to be formed like a Z or Z the nerves or Arteries to be fixed at the end of them, and when the Nerve is filled with Juice its transverse Diameter being enlarged it becomes shorter and draws the angles of the Villi nearer one another, and thereby makes all the Villi of the muscle shorter, This was as much as to say, that the motion of the muscle is made by the Villi; when really they do not in the least contribute to it

5th Borelli supposes the Vessels of the muscles to be of a Rhomboidal Figure, that by the action of the nerves, they are forced to the form of Squares

and

and so the muscles made thicker & shorter,
but no such thing can obtain, most of our Canals
being subject to equal pressure the transverse
Section of them must be Circular.

M^r. Berault in his mechanique de Animaux
says that our Canals are Elongated by the
Influx of Fluids into them, and so, by Stopping the
Course of them the Muscle must be shortned.

1^st. D^r. Morgagni is against M^r. Keil, and
Boerh: agrees with Berault in this Viz. That
the Muscles are Elongated by the Influx of
Fluids, or stretched beyond their Natural tone
which is Opposite to Contraction and whenever
the blood is Stopt the fibres recover themselves
by their Natural Elasticity, and so become shorter
which is their Contraction. But if it be so,
the Contraction of the Muscles must be Alternate
as the heart throws out its Blood, they must
have been exhausted et Vice Versa.

2^dly. D^r. Boerhaave's Opinion seems most just
and reasonable tho' Not liable to some Objections
he tells us the Brain is always Separating a
Liquor, which has the same property as Lymph
only

only it is much thinner, more Subtile and less
compressible and having less Cohesion by parts
The motion of this Liquor is very Slow, the heart
having no Effect on it, and there being nothing near
to disturb the Secretion is equall & constant, all
other Glands are placed near some moving Mus:
:cles, which makes their Secretion greater by some
times, whereas this is much in the same State
as the Gland of a Foetus, the only thing that can
have Effect upon it is the Soule, whose modus
Operandi we are Strangers to. This Liquor then is
Sent to the Villi of the muscles by the nerves Open:
:ing to the Sides of them, and so melts away
with the blood flowing in the Arteries in an equal
Stream, for its abode it is least in the Capillary
Arteries, so the natural Contraction will be in pro:
:portion to the force with which the Arteries are
moved, whether greater or less, and in all the muscles
it is equal to the Contraction of the Antagonist,
unless in some Morbid Case it is destroyed, then
its Antagonists become convulsed. This opinion
is then, Supposing the Villi of the muscles
either to be a Small nerve or an Opening to a
nerve, soe as at any time can command & deter:
:mine at pleasure a greater quantity of this

Fluid

Fluid to flow into the Villi of the muscle and that when its length can be increased its Transverse Diameter must be decreased and then the muscle is Contracted, and the Contraction will be in proportion to the force with which the Liquor is impelled. This is the most simple & Satisfactory account of a muscle, yet liable to objections, tho' not near so many as the one I mentioned; for instance first he might be asked how the heart could exert such a force in Driving the Animal Spt. to flow so little into it? one would think it Shd Communicate no more force, but in proportion to the small momentum of the fluids it receives from the Nerves. Why does not it send Blood in less quantities to the Brain &c and thus less Spt. would be separated and consequently its small Contraction be weakned, and so on till at length the Strength entirely decays? But to answer this objection he needs only prove the Liquor Nervosus to have tho standing the small momentum of its Velocity, does not exert a power superior to any Mechanical force, this will easily

easily appear if we consider, what a prodigious weight can be raised by a piece of whip Cord when moistened in water. Now this fluid of ours is capable of producing much greater Effects than any other, as it can more easily insinuate itself into the pores of any Body and pass out again and as its particles have infinitly less Cohesion with one another, than any other Liquor that we can subject to our Senses. 2dly another objection long to our Opinion may be raised. Viz. how come the Muscles to be capable of motion after Death. Ans. The Brain of an Eel will continue to act for some time taken out of the body, even for hours it will be found capable of motion if you breathe upon it? In answering this we must consider that tho' the impulse from the Brain has ceased yet the Fluids in the nerves are still going forwards, especially in an Eel whose body seems that the Circulation of the Fluids are so slow in this creature, the same thing happens in the Carcase of a Dog, for tho' at Death they are found distended with Chyle, yet in a few hours after they are quite empty, so the fluids of the nerves may still go on to fill the villi of the muscles after the

Brain

Braun has caused to act — Indeed if the aid Blood was necessary to Contraction of the muscles that must certainly cease in the space of two hours after death, for in that time the Blood is Coagulated as above, then the read blood is not necessary for the Contraction of the muscles. But how shall it act upon being pricked with a pen &c.? There must be something assumed here, that must be from Experience, but find that Stimulatens Med: heat and cause a Contraction whenever they are applied, we find also that naturally without the mond beeing Conscious we go into Accustomed habits, &c. by accustoming ourselves to a particular posture of Body we naturally fall into it without any kind of reflection: To this seems owing the Custom of turning our Eyes both one way. Besides warm water and our Breathes act in a Mechanical way, for the heat may rarify the Fluids and make them more Active But tho' we are ignorant of the Souls Operation on the bod &c Contrived we find by Experience when any person has a member amputated he fancies the member gives him pain a good while after it is cut off which

which argues that the Soul has a Care of all the parts of the Body, and that altho such a part be not Lasting yet the Idea of pain which that part formerly gave to the Soul is still represented in the most lively manner — The person must be even complain of it tho he Chuse himself afterwards, so if I may argue on the other Side, that the Body has a Care for the Soul, and thus when the Soul is gone, the Body strives in the same manner as if it was still present we are ignorant of the wonderful Sympathy between the Body and Soul, all we are certain of is our own Ignorance In this manner then I would Endeavour to account for the action of the muscles, but how the Animal Spirits make them Exert such a force, is I believe beyond the reach of human understanding: Man indeed is a noble creature & it is almost incredible to what a prodigious Talent his Intellectual faculties may arrive by improvement but still they are limited, and it has been the will of the wise Creator that some of the Secrets of Nature should be concealed from mortal Eyes.

XII.

XII Respiration

The Skin has Exhaling Vessels dispersing certain Particles from the Surface of our Body in form of a Vapour, which if detained would prove hurtful, this is called Perspiration. That this is constantly done, when in health we know by our daily Experience, when these Vessels are obstructed and hindered from doing their duty.

To be convinced of the truth of this we need only expose our Bodies against a white Wall, while the Sun shines upon it, for we shall see the Shadow of the Vapours rise up over our heads. The Qty of this Vapour has been found to be more than was imagained, and was discovered by Sanctorius in Italy, for weighing all he took into his Body and all he Evacuated, he found what he perspired by Glands, which he calls Miliary, from their resemblance to Millet Seeds, being immediately under the Skin upon the Flat. But the Existence of the Glands is much disputed, for what was taken for them is found to be nothing but small Cells of Fat. There is no such thing to be found, but in morbid Cases: all they

the Phaenomena of Sweating may easily be accounted for, upon the Supposition of those two: :going; upon Exercise the Motion and Fluidity of the Blood being increased, it makes it's way more forcibly thro' the Skin and in greater Quantities, which the Liquor relaxes the Extremities of the Vessels, they lose their Contractive power and become Pervious and so their Contents flow out. The use of the Cellular Substance under the Skin and thro' the Body to deposite a Quantity of Oily matter to be preserved from the quick Attrition that would soon make it rancid and fit to undergo some Preparation to be ready to be absorbed and mixed with the Blood, to blunt its Acrimony in some Diseases, for which sometimes there is great Occasion, accordingly we see how soon the fat is destroyed in many diseases.

XIII Nourishment, Increase and Decrease of the Body.

The Foetus during the nine months it is in the

86. the womb, turns a million of times bigger than it was
in the male Sperm, which is much owing to the soft
Consistence it has. Then the blood is more capable
of Thrusting out the Vessels, and there is but a small
Cohesion in their Coats. The nutritive Particles
thrust and insinuate themselves into the Pores that
are every where on the Coats of the Arteries; where other
such Particles circulate in those Canals, if there be any
Interstices in the Coats of the Vessels, so as the
Vessels are constantly thrusting outwards seeing
the Contraction and force of the heart is very dif-
ferent from & superior to that of the Arteries i.e.
as long as we grow, but when the Strength of the
Contraction of the Arteries comes to be pretty near
an Equilibrium with that of the heart we cease to
grow, and the Strength and Contraction of y^e Arteries
is always increasing while the force of the heart
decreasing, the Arteries at last receive violently the
force of the heart, and grow so rigid and stiff as
not to yield to it, and thus old age comes on and
the body loses its Bulk: & this rigidity proceeds
from the Coats of the Vessels being continually
rubbed on and worn by the Circulating Fluids,
and no new Nourishment being added, & the new
nourishment

nourishment which lay in the Capillary Arteries &c.
being Exhausted. For these are more stiff to allow
the Nutritive Particles to insinuate themselves
into the Interstices of their Coats, being the Forces of
the heart & Velocity of these are not equal, whereas
such a Supply is not made to the Coats of the great
Vessels, because the Velocity of the Blood is
so great in them as not to allow the Particles
to get easily to their Coats, otherwise they would
never grow larger. Thus you see there is a Plethora
in the Blood Vessels during the whole time of
the growth of the Body, for the Vessels are still
kept further Stretched till at last they come to
their tone — A Plethora is Occasioned by the
Vessels being Stretched beyond their natural tone
but lets see how the Vessels may be collapsed
in a manner and yet the Plethora happen. E. G.
Bleeding one frequently and taking little at a
time and nothing worth & you Diet, the Vessels
will so conform themselves to the quantity of
the blood, that any sudden repletion occasioned
by a full diet will soon produce a Plethora at
tended with all its Symptoms, whereas were all
the Vessels Stretched gradually they would be
capable

of capable of containing a much greater quantity
without any Plethore. — The same happens when
the Cavities of the Vessels are much diminished
by any Chronic Disease, a Sudden repletion in any
case will have the same Effect as to Circle produce
a Plethore, which in women is usually carried off
by the womb, because not only of the Smallness
of the Pressure, but the Blood having easier Exit
at the womb, than any other place. It is observable
that Apes and all other Creatures have no such
thing, unless when Vidently Stimulated by an
Orgasmus Veneris, they throw out a glary
Clothy kind of Substance from the Uterus, this
does not make its way out by a rupture of
the Vessels, for reasons which shall be given
afterwards, but by the Excrementies of the Uterus
that separate the Mucus, for the womb being
so dilated as to allow the red Globules to pass
and they close again as soon as the blood is
freed from its Plethorick State, it has been
observed that when women have had their
wombs obstructed so as not to allow a passage
for the Blood that way it has broke out
at

at the mouth, Nose, Orbits of the Eyes, Ears &c. and sometimes at the very Joints of the fingers, nay in short, many of the most favourable places, where it can find its way out.

XIV The Senses.

It will scarce be necessary to say much on this Subject, since it is so largely treated of by so many Authors. I shall only mention in general that Sensation is brought on by the impulse occasioned to the Fluids on the Nerves which is immediately felt at the fountain head, and here I must stop as the manner in which the Soul acts in the Brain will probably for ever be unknown to us. It is very probable that all Sensation may be occasioned by a Mechanical pressure against the Sensation of Smelling and tasting are performed the same way, for the Odoriferous particles must be carried forcibly through the Organs of Smelling by the rapid motion of the Air, and Sapid Substances must sometimes be pressed against the Palate by the Tongue before it can be sensible of the taste The rays of light collected in a focus will drive away a piece of Paper or other light Substance there and touch will shake all the Cords that are in the

the same Harmonick Proportion with the bounders.

The Sensation of touching is the most simple & of any a tangible body must be applied to the Papilla of the Nerves, with a force able to overcome The Insensibility of the Cuticula. If we meet with a firm resistance we judge the body hard, If we perceive a great many irritations on my Papilla Nervos & we judge the body rough. hard & unequal.

The Sensations of tasteing and Smelling differ very little from the former, but here the Vapid and Odoriferous Particles are Applied to the Papillæ Nervos: of the Tongue and of the membrane of the Nose, both of them must be moistned with a Liquor, which intermingles the Vapid and Odoriferous Particles, so that we are Sensible of the taste or Smell of the Body some time after it is gone. The Sympathy betwixt these two Senses are so Strong, that if you Stop your nose & at the same time Shut your Eyes, you will not distinguish betwixt tastes, unless they are very Acid. E. G. betwixt white wine and Claret &c. All Substances deprived of their Oil as Sal Tart. &c. taste very Acid on the Tongue, having but a biting taste, wherefore there

those that have Oil in them taste after a different manner, for the Salts are enabled to act more Strongly being carried on as in a Vehicle with a Subtile Oil which these Bodies have. The other two Senses are much more Complicated as their Objects have a great many Properties which cannot easily be subjected to our Senses The Structure of our Eye, but particularly of our Ear is very Intricate Light contains the 7 natural Colours, Viz red, Green, Yellow, Orang, Blue, white, and Black. By a different Combination and mixture of which, all other Colours are produced. What we call red, or Blue &c is only the Disposition which the parts of our body have to resist rays of such & such Colours That which reflects not but transmits we call Black, and what equally reflects all, we call White. — The motion of this light is not rectilineous, for it does not move in a parallel line, but from any Experiments we can make we may consider such rays of light which fall on Opaque Bodies as reflected, and the angle of Reflection is always equal to the angle of Incidence. If they fall on pellucid Bodies as our Eyes, and that in different Directions, according to

92. to the Density of the Medium they pass through;
for these rays when they pass from any rare Body
to one that is denser, they are reflected towards the
Perpendicular. Now when the rays of light come
from a rare medium the Air, to a denser, the aqueous
humours of the Eyes, they are converged, and this
is still increased by the Chrystalline humours and
the Vitreous can be compressed so as to be near the
same thickness with the Chrystalline, so the rays
of light may pass directly thro' to form a Focus
in the retina, or it may be much thinner than
the Chrystalline, for naturally, if there be occasion
and so the rays may diverge in it, & thus by
the Chrystalline humour being pressed farther
back or forwards, and perhaps altered in its
Convexity, the Eye can Accomodate itself to the
different distances of objects. We know there
to be far off, when the Processus Ciliaris is not
strained, as well as by the small angle of the
rays with one another that come to both Eyes
& Contra, Each point of any object has its
Corresponding point on the Retina, as may

be

be Seen by taking away the Coats from the bottom of the Eye of an Ox, for the image of a Candle held before the Eye will be distinctly pourtrayed on a piece of Paper held at the Bottom of the Eye. The use of the parts of the Ear are so little known to us that we can say little about them, but it is agreed upon by all, that sound is a Tumultuous motion Communicated to the Ear from a Sonorous Body, which motion is a kind of Intestine Struggle of particles of the Air which communicate this Sound to the fibres of the membrane Tympani that are in the same Harmonick proportion with the Sound of the Sonorous body that moves in the Air in the Cavity of the Ear, so as to make all its Bones move & Communicate the Sound to the Nerve which before it be Capable of any Sensation must be deprived of its Coats. The Internal Ear is so Situated, that the Sound falling on any part of the Ear, will at last fall into the Meatus Auditorius, according to the Law about the Angle of Incidence. For a further account of the Vision See Dr. Porterfields Book on that Subject, and for hearing Valsalva, de Aura humana.

Respiration

Respiration,
and the action of the Lungs.

It has been a difficult question in all ages, By what power the Air was sucked into the Lungs & is forced out of them again, and how this Action when once begun must be carried on ever after during life, whether Sleeping or waking without our being Conscious of it. — To any Account yet given of natural Respiration unanswerable objections have been started. — Dr. Martin has started difficulties to all the different Hypothesis, and endeavours to give what he calls an imperfect Account of Respiration. But it has been found that the Action of the Diaphragm may be wanting in this Case and yet the Animal live, as it happens in a great measure to women with Child and Hydropic Persons.

Mr. Lowe in the Philos: Transact. mentions a person whose Phrenic Nerves were Compressed and yet he continued to respire, tho' much in the same manner as a broken winded horse do, yet in Inspiration the Abdomen is Concave and in

Respiration

Respiration Convex — It is impossible to Ac-
:count for the respiration in Dr. Boerhaave's way
for the transverse Section of the Cellula of the Lungs
are never Circular, but rather like those of Honey
Combs, that is Hexagon: How can it be otherwise
Since they are not only surrounded with a membrane
but also contained in a Cavity, which will allow
them to Expand & so they must perp^{ly} or one an-
:other? By this means if they were Circular
the blood would have a free passage thro' the Lungs
when the Vessels are not distended with Air, thus
when we have once Expired we should never Inspire.
If the Vessels are Hexagons, and apply to each
other in Straight lines, the greater Compression of
the Blood will be when the Vessels are distended
with Air, and when it is thrust out again they
are Collapsed — In the Interval of these two States
the Blood can only pass. Dr. Cook relates a
good Exper^t which at first view Contradicts
this. — He laid open the Thorax of a Dog, and
by a pair of Bellows he distended the Lungs al-
:ternally, and this Creature lived for some time,
Then with two pair of Bellows he made a
Continued blowing, distended the Lungs very

violently

glo violently, yet the blood still passed. Then he made the Lungs collapse as in Expiration, by pressing them with his hand, and cutting a piece of them it came plentifully out — To answer this objection taken from the first part of the Experim.t we must Consider that as the Lungs wanded the compression of the containing parts of the Thorax, which makes a Resistance to the Bloods passage. To the 2.d part that the Blood might still flow out from the large Vessels, which are never quite empty, and had the Lungs been pressed by the Ribs it would not have run so freely. Mr. Boerhaave also forgot something he should have related. Viz. That a muscle being stretched becomes stronger; by Contraction weaker; this Circumstance may be of use to us afterwards; and that also the Respiratory organs are stronger than the Expir: atory, but they cannot perform this Effect if you force the air out of the Lungs and keep it out — The Lungs have a contractile power but not prior to the Inspiration which may be seen by placing the Lungs of any Animal in the Receiver of an Air pump, so as to shut out the

the air from the External Surface of them, and fixing the Trachea Ends, so as to permit the air to rush in at the way, which it will do & dilating them overcome their Contractile Force —
A Body that is Elastick as above, the more it is bended the more its Elasticity will increase so the Muscles when they are depressed, their Elasticity is increased — In a Fractus the Larynx is pulled up by its own proper Muscles, and all the parts about its neck are huddled together so that the Air could as little get into the Trachea as the Liquor Amnios into the Oesophagus and the Inspiratory Organs wanting the Pressure of the Atmosphere come to be overpowered by the Expiratory Ones, assisted by the Presence of the External Air, and so the Child never breathes in Utero. But when it is born its head is raised its neck stretched, and the Larynx pulled down while the Epiglottis by its natural Elasticity arises up, and all the muscles of the Thorax are set a going, by a natural Instinct if you please the External air then sets a rushing in violently and pressing the External Surface of the Lungs close against

against the Pleura, the Inspiratory organs when at naturally Stronger then the Expiratory come to prevail but then the Diaphragm & Intercostal muscles become weaker by Contracting whilst the Abdom.l and Cartilages of the Ribs being stretched, and thus they are brought to an Equilibrium, and a very small force will turn the Ballance to the Expiratory. Now the air within the Vessels of the Lungs being rarified by the heat preying upon the Pulmonary Arteries, hence the Blood gets in less Quantity to the left ventricle of the heart and aorta, and Consequently less Blood is sent thro' all the body, but the Inspiratory being all in action cant be relieved whilst the Expiratory have all their to Succeed for their Contraction already within them, hence the Expiratory assisted by the Elasticity of the Ribs, produce the Action of Respiration, in which the air having a narrow passage by the Glottis makes the Pleura convex outwards then the Lungs are collapsed, the Blood passes thro' them, and so comes to the Inspiratory Organs, but when too much collapsed the Blood again is stopped, and so the same

causes

causes take place as formerly in the Inspiration 99
Expiration again must follow, when the Air
finding a small passage thro' the Glottis, the
weight of the Internal Air makes the Pleura
Cricave Externally, the Lungs are always Con-
:tiguous to the Pleura, tho Morgagni denies it,
and gives an Experiment to Support his Opinion
but tho' I am far from doubting his fidelity or En-
:deavour to do the Exper.t yet he certainly how
by some means or other Cut the Pleura, and then
the Lungs must always Collapse. — I have made
the Experiment and always found them Conti-
:guous both in Inspiration & Expiration —
The Exper.t is carefully to dissect the Inter-
:costals Muscles, and avoid Cutting the Pleura
when you have done it look thro' the Pleura
and see the motion of the Lungs. And how can
it be otherwise, when the generality of Adult
Bodies tho they have never laboured under
a Pleurisy have their Lungs strongly Attached
to the Pleura, how should this happen if they
were not Contiguous, besides I think this may
be proved a priori, for if the Lungs were not

Contiguous

Contiguous to the Pleura, there must otherwise be a Vacuum or some air contained between them. If there is a Vacuum, why does not the air rushing in force the Lungs against the Pleura? It cannot be answered that Conhaesibility of the Lungs hinders this, and makes a resistance to the Air, for this should also hinder them from ceasing to such a Bulk, when the Sternum is taken off. — In the next place Air cannot be contained between them, else it would Counter Ballance the Air within the Lungs, and so hinder Inspiration. See Med. Ess. by Dr. Marten —

We come now to the use of the Lungs which is to break and divide the Particles of Blood, which had any Cohesion when circulating in the Veins and also that they may be made Small Compact and Dense enough to Circulate thro' the Body again, for we know that the Blood in the Pulmonary Vein, & Left Ventricle is more dense than that in the right Ventricle & Pulmonary artery, and consequently takes up less room which has been proved and the density of the Particles may add much to the red Colour of the Blood; Some Small proof may be brought

from

from Fishes, where the red Globules of the Blood are only found in the Bronchia or the Gills which they have instead of Lungs / being in their quality also the Glandular Substance at the head of their air Bag, and about their heart, all these Substances being continually pressed upon by the air in their Bags, which they can increase or diminish at pleasure, and at their pleasure by the Action of their Bronchia, their heart otherwise being near their Lungs. Except in these places there are no red Globules to be found in any part of their Body. — All this is brought about by the pressure the Blood suffers in the Lungs when passing thro them, when the Vessels are Extended with air — but whether any air enters in the Lungs is hard to determine, but it is certain there is air in the blood, which in a sound State does not use, this was aimed at by an Experm in which I assisted Mr Stuart It was thus performed: we cut a large piece out of the vena Cava inferior, and Carotid artery before it divides, when they were well filled with Blood / then the Vessels being the most proper for the

Experiments

Experiment because they run a great way before they
send off any Branches. Then we threw them into the wa-
ter which we had before, by the Thermometer brought
again to the same degree of heat, as the blood in
a living Creature, out of which we Evacuated all
the Air lest that in the water, should keep an Equi-
librium with that in the Blood, and so hinder it
to act and dilate the Vessels. Then we set the
water under a Receiver, and Exhausted the Air
leaving it under the receiver a good while
we found the Air Expand itself very considerably
& the Mercurial Gage had risen 17 Inches above
the Vein, and 22 before the Artery began to rise.
The Experiment proves that the Air in the
Blood cannot be brought to act but with great
difficulty, and when it does I have seen the
worst Effects. Mr. Petit has given several In-
stances of wounds, whereby the Air has been
let into the blood, and produced bad Effects
but the question is which way it gets into the
Body: Some make it to get in by the Lungs
and to prove this Morgagni in the Head. Boyle

gives

gives a Scheme shewing that he Injected by 103.
the Trachea Arteria, and it came out by the
Pulmonary Vein, and to avoid any objection
being made to this, Viz. That the Air would become
useless by Repeated Circulations, he Alledges that y
air after some Circulations is thrown out by the
Pulmonary. But Mr. Bellfinch says that
Morgagni allowed it to get into the Pulmonick
Vessels where there was Air before, but from se:
veral Experiments it is probable, that Something
call it what you will, the Pabulum Vitæ, that Desc
Vag. of Sir Isaac Newton which is so necessary
to the Nourishm.t of fire, and after it has passed thro
it, and been consumed it makes the Air
useless, and even fatal to Animals, which is
proved by Animals being killed by receiving air
thro' the red hot Barrel of a Gun. Besides the
Presence of the Air is necessary to our well being
tho' the air in the Blood has not Elastic Par:
:ticles, for an Animal is presently killed by ha:
:ving air Injected into the Veins, so as to Circulate
in the Blood, yet it is something on the nature
of Air, and as it really is, I doubt, will not be

Sufficiently

We. sufficiently demonstrated, besides the use of the air in Respiration, the Voice is performed by it according to the different Apertures of the Glottis and its Tension, being assisted by the Cavity of the mouth and nose rebounding as in so many Vaults, as is evident by the trembling of the nose that is felt when we speak, so that Letters or words are formed by the Glottis, some by the Tongue, others by the Lips &c as you may see in Dr. Neils Chap: concerning the Larynx &c

XV. Generation of the Menstrual Flux

The Testes of the male serve for preparing a thick, balmy and white Liquor called Semen or Seed, in which when Viewed with a Microscope we perceive a great number of Animalcules Swiming about. If this Liquor is not Separated there is a considerable Change made in the body as we see in all Animals that have been Castrated, Perhaps this is for want of some thing that Sh. be Seperated from the Testicles into the Blood. There have been considerable disputes whether these Animalcules are originally

in

in the Testicles, and that thick glutinous mat:
:ter Separated there may be Vehicle for them.
However it be, they are to be seen in the Semen
with good Glasses. — When this Liquor is to
be Injected the Musc. Erector. Penis Compres
the ven Dors: close to the Os Pubis, to hinder
the refluent Blood from passing and to distend
the Corp. Cavernos. Penis, at the same time the
Levator Ani draws the Rectum nearer the
Bladder, and Consequently presses upon the
Vesicul. Seminal. which by behaving there
Muscles, they press likewise upon Corpus Cavernos;
the Nerves and the Glands that compose it are
repelled backwards, distended and swelled, &
thus the Penis is Erected, that it may be more
easily introduced and Convey the Semen, which
has a free passage out of the Urethra it being
straight and free of wrinkles by the distension
of the Corp: Cavernos: In this action all the mus:
:cles above are Convulsed, and there is a greater
derivation of Blood & Spirits to the parts.

Before we see what the Female contributes to
Generation we must consider a Phenomenon which has

puzzled

106. puzzled Physiologists almost in all ages, I
mean the menstrual Fluxe which is a Periodical
Evacuation of Blood from the Uterus & vagina
(according to some every 28 days or Lunar months
from which it have its name) in greater or less
Quantity, according to the different Constitutions —
In women that live regularly & have good Consti-
:tutions, this Evacuat.n begins at the years of
Puberty, and Continues till near 50 for the most
part pretty regularly every month, when the menses
first begin to flow, the Mammæ turns bigger and
the Girl begins to have uneasy pain's thro her
whole body, but especially in her thighs, a
great tensity and weight, as it were in the Hy-
:pogastric Region, reaching to vomit, Gripes in
her Belly, and sometimes Diarrhœa, her Colour
is pale and yellowish, for ordinary she have a
small quantity at first, & sometimes they
flow irregularly, perhaps in great Quantities
at one time, and again she may not see them
for several months after; If this Evacuation
is stopt the whole Constitution is Endangered &
all kinds of diseases may be brought on —

When

When old age comes on, it gradually wears off, and came on with very bad Symptoms. Hence arises the question whether the Blood comes from the Uterus or the Vagina? They are both capable to give it a passage, as their structures are near equal but in a sound and natural State when the woman is not with Child, it certainly comes from the Uterus, I saw a Child with a Procidentia Uteri, where its Vessels were so dilated as to admit the red Globules of Blood to pass. Those who advance it came from the Vagina, have probably seen some Instances of it in women with Child, or who have had the Cavity of the womb any way filled up. But these are Extraordinary Cases. The Question is Whence should this Evacuation come so regularly? This as well as the other Questions in Physiology, have been accounted for in diff. ages, according to the different Physiologists then in being. The Chemists would have it brought about by their Effervescence &c.

Then the notion obtained of the Planets having a great influence over the parts & functions of our bodies, hence the moon was said to have

influence

108. influence over this Evacuation, but we see it
come at all times of the moon indiscriminately
which makes this Doctrine Groundless. Since
the Introduction of Mechanicks, it is with more
probability ascribed to a Plethora, It is certain
that women are so formed as to take in more
aliments than are necessary for their nou-
rishment, which excess will be greatest at
the time they cease to grow, which being collected
in a considerable Quantity must have an Exit
and this probably will be at the place where
Blood is sent in greatest Quantity in pro-
portion to the part, and where the Vessels do
most easily yield, i. e. at the Uterus But before
we go any further it will be necessary to Ex-
plain what we mean by a Plethora, for as
a good many hot disputes have arisen about
this Question, merely from the different notion
People have of it — all the Vessels then
being more or less stretched without any
disorder happening in one case, and Ina-
nition in the other. These two periods are
different in different persons, so that when
we

we speak of the Tone of the Vessels in any person we mean as they are at present, and not what has been or may be. Thus any Quantity of Fluids that is able to distend the Vessels beyond their Natural tone is called a Plethora, which makes the Vessels unactive: tive and destroys their Elasticity, till some Hæmorrhagia or other be applied, and they be emptied. Thus in both Plethora and Inanition, there must be a Slowness in the Pulse, but in the first it is full and hard, and the Arteries firm like Cords. But what presumption have we of Women having a Plethora, and how do we account such an Evacuation as this? Sanctorius answers that Women live a Sedentary life, and consequently have less Perspiration than men, and thus become Plethoric: and as such men as live an Effeminate life have the same Causes taking place, they have some Evacuation or other analogous to this, as by Urine, Hæmorrhoids, Diarrhœa &c. I have seen several who had such Evacuations, who could exactly tell the time they were to happen, some taking it from Dr. Hales Authority, who did not find Sanctorius's calculations agree with his. I respect Sanctorius to have wrote a piece of

Theory

110. Theory, precognized by Dr. Keils way of living differing from Sanctorius, for the Dr. spent his time sitting walking up and down, being much hurried with business, and Paulo plus potum coming in frequently between his Calculations, I dont wonder the same thing did not happen to him, as to Sanctorius who led a regular life, and was certainly fitter for making Experiments of this kind. — He saith fully ye: Rules of that he observed, and his Authority is more to be depended on in this Case than Dr. Keils — When there be a Plethory, the Fluids will be more determined to the above mentioned places, where the Vessels make the least Resistance to the Uterus first, & then to the Mamma, hence women know the Approach of the menses by the weight of their Bellies & Regio Pubis & hardness of ye Mamma. The momentum of the Blood distending the small Vessels of the Uterus makes their mouths Open & empty themselves by pouring their Contents into its Cavity. Dr. Friend has presumed a Rupture of the Vessels but if this Happens they must Cicatrize every time they are broken, and hence in a short time the womb would turn Callous & it would be impossible for the Blood to break thro' it. But some Object against

against this Doctrine, that some women labouring under a Phthisis Pulm: or other such Linguine diseases, still have their menses regularly; Now they say there can be no Plethora, But it is always quoad vires Vasorum, here the Fluids are not only diminished, but the Vessels are proportionally weaker, and have a less Elasticity, and so a less quantity of Fluids is able to Overcome them. Perhaps in a healthy woman 30 lib. of Blood will not cause a Plethora, whereas if she was reduced low, by any Chronic Disease 10 lib may make her Plethoric — Again some observe that Bleeding in the Intervals will not prevent their Regular return, and make this an Objection to its being occasioned by a Plethora. For say they, if there was lib j, of blood to be Evacuated by the Uterus, thereby taking away ℥ viij, in the Interval of the Evacuation there ought to be evacuated the half more blood, yet we see this makes no alteration. But Sanctorius supposes, that after bleeding Perspiration is diminished some days like the Blood comes to its former weight. — Indeed Bleeding is used with very good success in bringing on this Evacuation when stopped, but this happens when the Fluids is so augmented as to distend the Vessels to too great a degree. This

Thus they lose their Spring & the Blood cannot be propelled, but by taking away a little by which the Vessels recover their Tone & Elasticity, which Jar'd Balances the Key taken away. — I affirm when there are Signs of a Plethora being very strong such as pain of the head, heaviness in the whole Body uneasiness in any kind of motion, as in moving ones Fingers and hands, & stiffness or Tension, Swelling of the Eye Balls, and Nose, but hard and strong Pulse I say that Bleeding in such a case is absolutely necessary for it has been found, that after it the Menses have come on in less than half an hour.

This is not to be practised, unless indicated by strong Plethoric Symptoms as above. But to return it has been objected that some women have a constant Fellicidium from the Uterus. But this comes from the thinness of the Blood. In short there can be no Objection made against it, but may easily be accommodated to a Plethora. The most part of the objections seem rather to confirm it, after an impartial and particular Examination of every circumstance. — Some would have the Defect of The Uterus Plethoric and no other, but from whence does the Uterus get the Blood? why, from the aorta Descendens say they, the aorta then had it to spare or needed not? certainly then must be an Transition & there can be no

mention made here of the Sinus of the womb being filled 113.
with Blood to occasion the menstrual Flux, for according
to that doctrine the menstrua having once flowed, when the
Blood and Womb were come to their natural Tone the
Flux would never return again, seeing that the Blood
has no further penetrated to the Sinuses; I need not men-
tion the common Opinion of Menstruous Blood being
of a poisonous Nature, for it does not certainly differ
from other Blood except so far as it may putrify
sooner and lose somewhat of its moisture when out
of the Vessels.

Now it is agreed that the female contains the proper
ovum for the Embrio, till it is able to bear the injuries
of the Atmosphere, but no Animal can be produced with-
out the Assistance of the Male who has the proper
Instruments for conveying the Semen into the Uterus
as has been particularly known in several Cases by
Thuysch who tells us of women who were immediately
killed after Coition, in whose Uteri the Seed was found
If you take his word for it, for he did not put it
to a Trial as he ought to have done, and then
he might have told Exactly, whether the white
glary Substance which he saw was Seed or not
but the Influence of the blood goes much further

for

for the Ovum has been impregnated in the Ovarium and sometimes the Embryo formed in the Tuba Fallopiana & Extra Uterine Fœtuses have been found adhering to the parts of the Abdomen by all which it appears, that the Seed has some Influence over the Ovum while it is in the Ovarium, for the Tubæ Fallop: change their Situation wonderfully, turn round and grasp the Ovarium close and taking hold of one of the Ovules brings it to the Uterus as has been found by dissecting Bodies after a fruitful Coition whether or not this be the ordinary way is uncertain but if the Ovum be too long or meets with any resistance in the Tub: Fallop: it may grow there — again if the Coats of the Ovarium are too thick to allow the Ovum to fall down easily then the Impregnation may go on in the Ovarium or if the Ovarium lets go its hold before the Ovum is quite separated it leaves it hanging by a small Pendicle, and this soon gives way & the Ovum falls down into the Abdomen & is carried to the first part it meets with hence an Extra Uterine Fœtus is produced. The human Ovum is a round Body surrounded with a Yellow Substance much like the Yolk of an Egg, they are covered with a Pleaxus of Vessels, or a Vesicular membrane. In Bodies after Conception we see a small Calix or Cup, out of

of which the impregnated Ovum has fallen. But the means of Impregnation is produced a Question, not so easily solved. Whether the Rudiments of the Embryo existed in the Loins of the father, or were impregnated in the Organs of the mother? As soon as the little Embryo comes to be subjected to our senses it is very like the Animalcules in Semine Masculino. The most general Opinion is this, Viz. That the Tub: Fallop: enters one of the Ovula, and hinders any thing else from getting in, & so the Impregnation goes on. But how comes it to pass, that so many Animalcules are thrown into the womb alone, in the Seed, at the time of Coition, and only one or two impregnated? This question has some difficulty in it, but without enquiring into the wise Operation which is about our reach in this as well as in other things, we may suppose that the same holds good in this as in large Vegetables, for have many seeds grow on one plant or Tree that do not come up when sowed, so there may be a great many Animalcules thrown into the Uterus at once, and yet but one Embryo propagated by the Tub: Fallop: denying a passage to any more than one, but another Objection arises from the hand

How comes it to pass that the Mule has both y^e form of the horse & Ass, for if the Embryo was entirely from the males Sperm one would think it would entirely have the form of the father. But consider in answer to this, what a vast change nourishment makes in Animals, for tho' the Animal be entirely in semine masculino, yet being nourished by the mother in the womb, whild it is soft & like Jelly how easily may it receive the impression of the mothers likness, as a Lamb nourished by a Goat gets a hard coarse hair instead of a woolly soft fleece, and if such a vast change be brought about in the Animal after birth, what a much greater change may we expect when it is in so soft a carbonelance as in the womb? another Question relating to this doctrine and not easily solved, is, That the Animal Existing in semen masculi having got into the Ovules so far as to impregnate it, is carried down to the womb by the Tub: Fallop: and the membranes begetten coming down the Tubæ are the membranes of the Fœtus, and indeed the Animalcules are so small in the Sperm that we cannot know whether it has the Funis Umbilicis sticking to it or not, but we may suppose that it has & that the Hope

Communicates

Communicates with the membrane of the Fœtus,
the Placenta comes to be formed & so the Communicati-
:on between the mother and the Child is brought on, or
the Coats of the impregnated Ovum makes the membrane
of the Fœtus, another Opinion is, that the Animalcules
were formed in the Ovarium of the Female, but still
this is liable to greater objections Viz. when does it not
come to perfection as it has all the things proper & requisi-
:ite for life? If so we should certainly have the history
of Birth without the Copulation of male & Female, but
since the Creation there has been no such thing. Perhaps
it may be said that it is dead and only Set on motion
by the Subtile Aura Seminales of the male ——
But if it was dead it would have no circulation, &
so Corrupt: Seeing therefore there is no such Liquor
in the Human body that has Animalcules in it
unless it has been Exposed to the Air, as the Liquor
sticking to the teeth has a great number which
are produced from the Seed of Animals floating in
the Air and sticking to the Teeth, and seeing an Inci-
:dent when a person has the Lues Venerea, and at
such times the Person is not prolific, and since
these Liquors do not appear like the Liquors of Pu-
:berty, I say considering all these things we may
conclude that these Animalcules are men & women,

they

Thos by reason of the smalness of the parts, we cannot
solve all difficulties, as if they were subjected to our
senses. This Doctrine is liable to such objections
than the other. Now suppose the Impregnated
Ovum to tumble down the Tub: Gallop: into the
Uterus. The circulation is kept up by the Vasa
umbilicalia stretched out into the Placenta by
Ruysch's observations it is evident that all over
the Fundus of the Uterus, there are large Vessels
spread, and we see the Placenta adhere to the place
where we would think it least fit for the purpose
viz. Near the Os Intern. Uter. where the large
blood vessels are, and the place to which the
Placenta adheres is the most thick and strong, for
all the other parts increase faster than it does,
and so the proportion of the Placenta to the parts
becomes smaller. All that I can say of the
nutrition of the Fœtus in Utero is in the 2d.
Vol. of the medical Essays.

XVI of the Circulation of the Blood in the Fœtus.

The Blood being brought from the Uterine
arteries of the mother into the Umbilical Veins

of

of the Foetus, that of the Placenta is thrown into the Capsula Glissoniana by the Umbilical Vein, and immediatly by the Vena Cava to the Dext. Venos. The rest circulates in the Ven. Port. thro' the Liver and is received by the Extreme branches of the Cava. This Blood in the Cava is sent to the right auricle 1/3 of it to the left Auricle by the Foramen Ovale and the rest into the right Ventricle from whence it goes to the Pulmonary Artery, and so to the Aorta Descendens by the Canal. Arterios. The third that went thro' the Lungs comes back to the left Pul: monary Vein, and there meets with the Blood brought thither by the Foramen Oval. to be sent together to the Left Ventricle, thence into the Aorta to be Distributed thro' the body, with that from the Canal. Arterios. The design of this mechanism is to prevent the whole mass of Blood from passing thro' the Collapsed Lungs of the Foetus but that it might perform the Circulation thro' the Foramen Ovale. This was the Opinion that prevailed universally, since the discovery of the Foramen ovale, till the end of the last Century, when it was Opposed by Mr. Morice, who is pretty Singular in his Opinion, he would have it that the Foramen

ovale

120. Ovale : not cap of Transmitting the blood from the right to the Left Auricle did the reverse, and for no other reason but because he observed in the Foetus that the Pulmonary Artery is longer than the Aorta, and Consequently it contained more Liquor. Of this Opinion was Mr. Rohault, But Mr. Du Verney disputes the point with him, & says, That upon measuring both the Arteries the Aorta was the largest, besides if it were as Mr. Morice would have it, the right ventricle would be the largest, which no body can affirm, and yet to be found that the Pulmonary Artery is as large then I think this objection is answered. now Suppose the thickness of the Arteries to be in proportion to the force exerted by their respective Ventricles, yet the Blood in the aorta meets with less resistance than that in the Pulmonary Artery which have not only the collapsed Lungs to go through but have also the resistance of the Blood, in the aorta proceeding from the Axis to the Circumference, so the Reaction of the Fluids is greater against the Canal of the Arteria Pulmonalis Consequently the fibres will be more stretched. Mr. Morice might be led into this mistake by Injecting water into both

both Arteries, for then it is plain the Pulmonary Artery having the greatest Coat would be most distended, or even tho' he did not inject them, the Aorta having the greatest Elasticity would of course Contract most, and so appear less Capacious. But they who wrote against Mr. Mariotte founded their argument chiefly on this, that the Arteria Pulmonalis was really less than the Aorta. Mr. Winslow endeavoured to reconcile both these opinions, by asserting that the Foramen ovale will allow the Blood to pass either way, and that two equal quantities are transmitted to both Ventricles, and the blood is blended here, for, says he, if you put the Foramen into its natural Situation, which is done by shaking the heart among water, it will move to either side. This Paper of Winslows is severely criticised by Mr. Rohault Professor at Turin, in a Paper which he sent to the Academy, but they would not insert it. Mr. Winslow wrote an Answer to it. Rohault being a Scholar of Mariotte's strongly defended his masters opinion, building principally upon the Appearance of some dried Preparations, so that not considering the Pulmonary Artery might be more

Watched

122. Stretched than the aorta, and be as large with-
out transmitting so much Blood, tho' if we
should admit of any of these uncommon Opinions
we should have the right Ventricle more capacious
than the left, or if we should suppose the fora-
men Ovale capable of transmitting ⅓ of the
whole mass of Blood, being from the right Ventricle
⅓ should pass by the Carotides Arteriales into the
aorta, and the remaining would circulate thro'
the Lungs, and so go to the left Auricle, of which
½ would be transmitted by the Foramen to the
Right Auricle, and the rest would go into the
Left Auricle, & meet with the Blood from the
Foramen Ovale to go with it to the right Ven-
tricle and circulate as before, so that by
this means, the whole mass of Blood is expelled
by the right Ventricle, only ⅓ by the Left.
How then comes it to pass that the right is not
three times as large as the Left?
Mr Windlow's opinion is, That the Foramen is
equal either way, which is all one as if there
was no Foramen at all. The whole mass of Blood
is

is thrown from the Right Auricle into the Left Ventricle, thence into the Pulm: Artery, and then ⅓ is sent by the Canal Arterios: into the Aorta, and ⅔ are transmitted thro' the Lungs, and returned by the Pulmonary Vein, thence to the left ventricle and so to be sent thro' the whole body, which with ⅓ sent by the Canal Arterios: into the Aorta & ⅔ are transmitted thro' the Lungs, and returned by the Pulmonary vein, thence to the Left Ventricle and so to be sent thro' the whole body, which with ⅓ sent by the Canal Arterios: returned to the right ventricle, which undergoes the same taske, i.e. the right Ventricle Expells the whole mass of Blood & the Left only ⅔ of it, that is the Left is only ⅓ less than the right, but if we suppose with the common opinion, the Foramen ovale to convey from the right Ventricle, then ⅓ of the whole mass of Blood goes from the right Auricle to the Left, and so to the left ventricle, and the other ⅔ to be sent by the right Ventricle to the Pulm: artery, ⅓ of which goes into the Canal Arterios: or the Aorta, and the other half is returned by the Pulmonary vein into the Left Auricle, and so together with that got from the Right Auricle, by the Foramen Ovale is sent to the Left

ventricle

Ventricle, and so into the Aorta, it meets with ½ from the Canal: Arteriosa with which it is distributed to the body, and all returned again into the right Ventricle as before. Thus the Blood is continually passing from the Fœtus as well as to it, by a Continuance of both Ventricles by means of the Fœtus's Vices, and so on to the Placenta. You see all this time I have been talking of a greater Quantity of Blood being sent to the Fœtus by the Umbilical artery than is sent from it. — This still argues for the best and common Opinion, there being the greatest necessity for such a Passage the more the quantity is increased. Dr. Nicholls in his Syllab: hath advanced a pretty singular opinion. He will not allow the two Ventricles to be Synchronous but Anchronous to the right Ventricle, the left Auricle and Aorta. To this I may only answer, that any one may convince himself of the Falsity of this Effect by autopsy; again he says the blood in the Cava descendens or Inferior is more fit for nutrition, muscular motion & subtle function than that in the Cava Superior, because says he it consists of the Blood newly sent from the mother

Flow

How the Blood shd be rendered defective in the Liver by having a subtile Secretion made from it is still a greater Mystery, and how the Stomach & Emulgents should contain such fine Blood a very strange thing it is no generally agreed upon, that the Glandulæ Renales are purposely made to dilute the thick blood returning from the Kidneys — Then he affirms that the Aorta, Cava Ascendens, & Descendens are antisonous to one another — It is a great pity that this piece of Theory is destroyed, by observing that the Temporal and Umbilical Arteries Beat always at one time — The greatest design of this is to make the Blood in the Cava Superior to be sent into the Inferior Branches of the Aorta, which he does in this manner he makes his subtile Blood in the Cava Inferior come to the right Sinus Venosus at the same time that the left auricle is contracted therefore it goes all to the head & substance of the heart by Coronary Arteries. This Blood remaining in the Cava Superior is immediately sent into the right Auricle, so much of it being sent to the left by the Lungs to be mixed with the Blood in the Cava Inferior, and the rest sent by

126. by the Canal: Arterios: into the Aorta Descendens on purpose says he that the gross venous Blood may be sent back to the mother, but it seems very Many that the right Should be so dilate the aorta when the left is not Contracted: but if so, there must be no Blood in the Aorta, but in that place where the ascending Branches go off, & the Canal: arterios: enters: how Dr. the Blood in the two Cavas can be blended when there is an unequal Stream and not as the Dr. would have it in such particular Streams or times? again this thick gross Blood, that the Dr. would have sent to the mother seems to be the finest in the whole Body, for it gets the Lymph from the Receptacul: Chyli Glandulæ Pituitariæ, Thyroid &c. This is a Specimen of Dr. Nicholls Theory, which is not only Contradictory to the received principles of Animal Oeconomy, but also the most known Anatomical Facts, so it is needless to refute it longer seeing the Dr. makes one Sentence refute the other as well as any could do after him. It seems to be an absurd Theory it is wonderful how it came to be thought upon, but he has not only broached, but disputed it in the same Book—

Fl

It has been disputed, whether there is a Sac in the human Body to contain the Urine of the Fœtus, but it cannot be so soon determined, since the Opportunities of dissecting women are very rare, but in those, in whom I have had Occasion to dissect I could see no such Membrane, however I impute this rather to the want of Skill, than the non Existence of it — I think there must be a human Allantois, and that the human Fœtus should be provided with such a Membrane as well as Brutes, Several observations seems to confirm its Existence E. G. Some Children who have no Passage by the Urethra have Evacuated all their Urine by the Navel, and Mr. Littre and D. Haller sent to the Acad: of London and Paris Dissertations of human Allantois — Again from Children there comes away two different Liquors, at two different times, which can be no other than Urine and Liquor Amnij —

The posture of the Fœtus is such as we naturally fall into when we Sleep, which is owing to the power of the muscles in bending such & such parts in particular Directions by the advantage they have of their Antagonists, either by the Situation of the parts,

parts, then angles of motion on the Lower with which they act.

When the Fœtus has lien its full time in the uterus, the contents of its hollow Viscera begin to turn acrid & stimulate the parts, which make the Child uneasy, and being weary of its Confinment begins to bounce and kick about; at the same time the Irritation of the womb makes the fibres contract, bringing the neighbouring parts into Convent and making them contract also, whilst the Child is making Efforts to get out, by spurning against the Intestines of the Stomach with its Feet; in a natural Birth, and pushing its head against the Os Intestinum Uteri; at last breaches the membranes & lets out the water to lubricate the passage & relaxes gradually, which was before shut up, by a glutinous Matter, and make it slippery, so that the Child comes away more easily, being drawn gently thro' the vagina into the world. — Formerly I shewed you how Respiration was a necessary Consequence of the Childs neck being rewed, and the Trahea Arteria being Expos'd to the pressure of y Atmosphere

which

which, whenever the Child Inspires is taken off from the Pulmonary Artery and the Blood forces more easily by the Canal. Arteriosus: which indeed soon grow together, when its Blood at any time meets wth greater Resistance from that in the Aorta pressing against the Sides, and now the resistance increases for in a Fœtus ⅔ of the whole Blood came out of each Ventricle, but now the whole mass passes thro there, a greater quantity of Blood coming by the Pulmonary Vein from the Lungs into y^e^ Left Ventricle and having its Velocity increased by the action of the Lungs, will press more strongly the Foramen Ovale so that no Blood comes from the right into the Left Ventricle, and the Membrane grows to the Foramen and there being no Blood in the Ven. Umbilicus it grows together, and is called Ligament. Rotund. Hepat. and there being less Blood in the Capsula Glissoniana it will have less force to open the Duc: Venosus, then the pressure is increased in the Sides of the Duct, especially in Inspiration by the Viscera Abdominalia. Thus you see all these Changes proceed from the Expansion of the Lungs with Air

Finis

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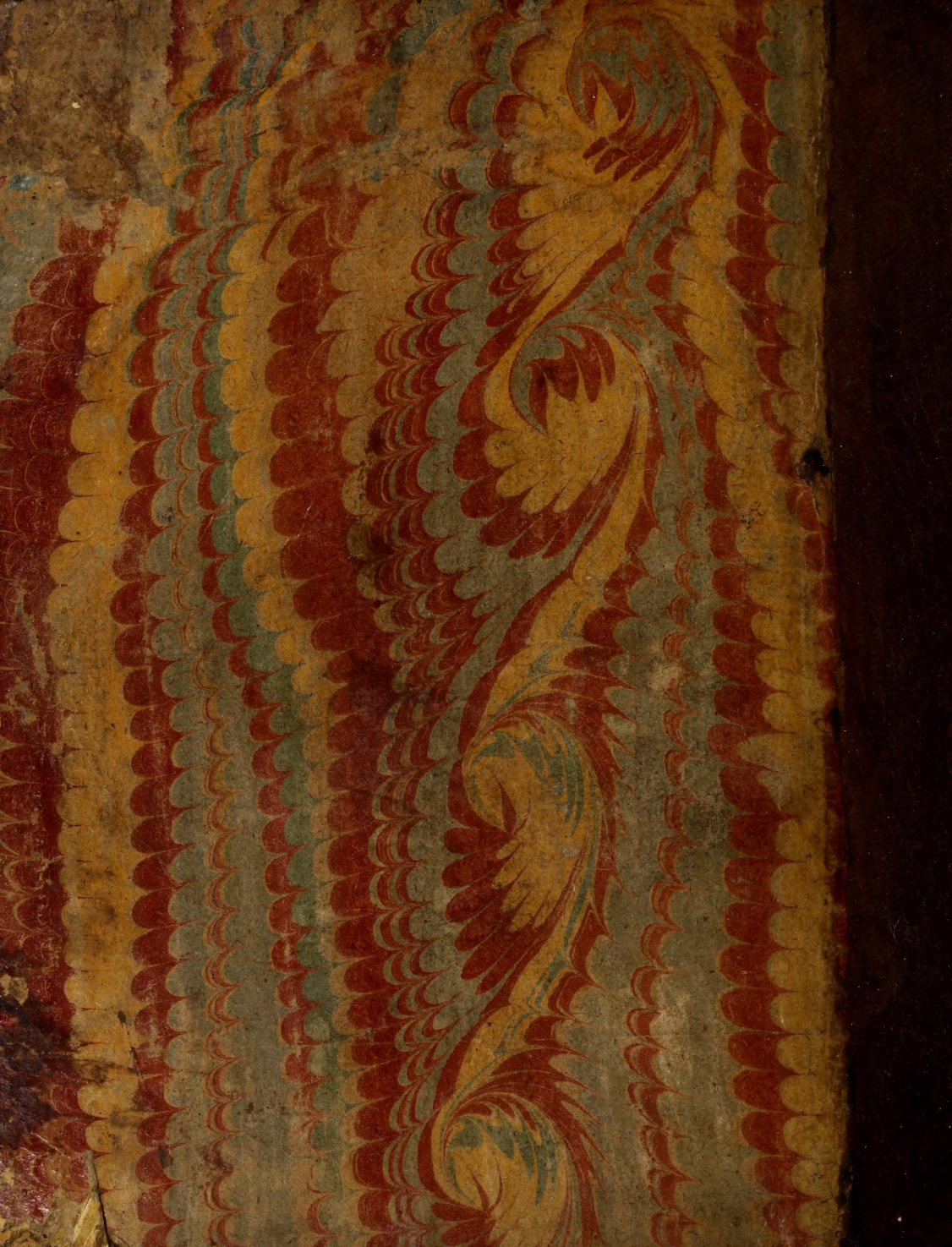
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